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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW
Entered as second class matter February 10, 1903, at the post-office at New York under the Act of 1879
A MONTHLY JOURNAL RELATING TO THE METAL AND PLATING TRADES

RESULTS!

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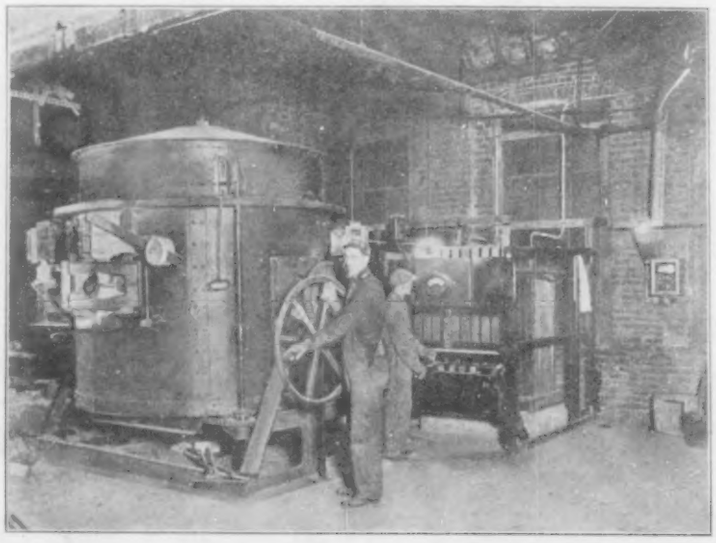
ited States and $1 Per Year Canada, Published Monthly by The Metal Industry Publishing Company 99 John Street, New York Other Countries, $2 Per Year

BAILY ELECTRIC FURNACES

COMPLETE MELTING UNITS



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BAILY ELECTRIC FURNACE units are built to meet every melting need. Furnaces range from 40 K.W. to 1500 K.W., with hearth capacities from 300 pounds to 40 tons.

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ALLIANCE, OHIO

THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER:
ELECTRO-PLATERS REVIEW

Vol. 17 NEW YORK, AUGUST, 1919 No. 8

METAL PARTS OF AIRPLANES

A Brief Article Telling How The Elements of the Earth Conquer the Elements of the Air. Written for The Metal Industry by W. D. Richardson, Curtiss Aeroplane and Motor Corporation.

It is a rather queer anomaly but most of the materials used in the construction of an airplane comes from the ground.

Little perhaps does the miner in far off Tasmania realize that the ore he is digging out of the bowels of the earth today will appear some time later in a machine capable of flying in the air with the freedom of the bird.

The entire world is combed for materials used in the construction of the modern-day aeroplane. While it is true that the United States is now able to produce most of the metals used in aeroplane construction, still there are some which we are still forced to look for in distant lands.

There are three main classes of materials used in building the airplane—woods, metals and miscellaneous materials, such as cotton, linen, paints, fiber, bakalite, rubber, glue and varnish.

The metals, with which this article will deal, are again divided into two great classes—the ferrous and the non-ferrous. The ferrous includes cast iron and steel; the non-ferrous, aluminum, copper, magnesium and babbitt metal.

Cast iron is commonly used for piston rings and cylinder heads and the ore is for the most part either found or refined in the states of Pennsylvania, Minnesota, Ohio, Alabama, Tennessee, Illinois, Michigan, Wis-

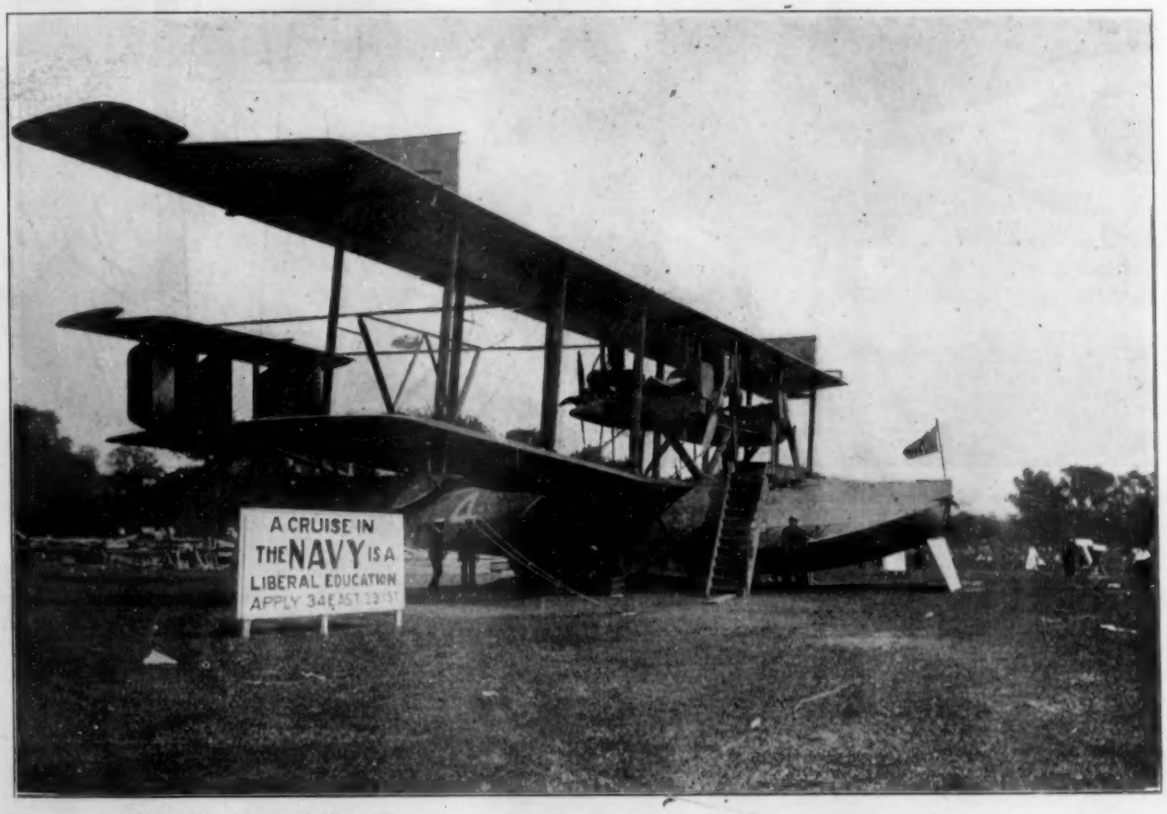

Photo by courtesy of Curtiss Aeroplane and Motor Corporation.

FIG. 1. THE N.C. (NAVY CURTISS) 4 ON DISPLAY AT CENTRAL PARK, N. Y., AFTER HER SUCCESSFUL FLIGHT ACROSS THE ATLANTIC OCEAN. THIS MACHINE WAS THE FIRST HEAVIER-THAN-AIR MACHINE TO CROSS THE OCEAN

consin and West Virginia.

The steels usually employed in aeroplane motor and other aeroplane construction are known as alloy-steels and are produced chiefly in Pennsylvania, West Virginia, New York, Illinois and New Jersey. Alloy-steel of exceptional quality are called in aeroplane nomenclature high-speed steels. All of these metals are made by the Bessemer, the Open Hearth or the Crucible processes, the quality of product varying inversely with the order given. The simplest steel alloy is carbon steel.

In aeroplane motor construction, nickel, chromium, vanadium, tungsten, molybdenum, cobalt, titanium and manganese steels are used; sometimes combinations are employed, as chrome-nickel, chrome-vanadium, etc. It is difficult to distinguish between the qualities given the resultant steel by the different alloys. Most of them impart greater hardness or resistance to heat. It will be sufficient to note that nickel-steel combines ductility and hardness, does not rust easily, has a low co-efficient of expansion and a high resistance to stress. It is accordingly often used in crank-shaft construction. Vanadium is valuable for its hardness and shock-resisting qualities, which it imparts in a degree to the steel in which it is used. Tungsten is used in steel for values, as it gives a surface of peculiar resistant quality.

In regard to the sources of supply of these various alloy metals: Nickel can be obtained from North Carolina, Oregon and Spain; vanadium is extracted from an ore found chiefly in Utah and Colorado; tungsten, extracted from scheelite, wolframite and hubnerite, can be got in ore from Connecticut, Colorado, New Mexico, Nevada, Arizona, Germany, England, Argentine and Australasia. The chief sources of molybdenite are New England, New York, Pennsylvania, Colorado, California, Canada, Germany, Norway and Sweden. In rough form, cobalt is known as amalite which is found chiefly in Germany and cobalite, found in the Scandinavian peninsula. Titanium deposits are located in the Adirondacks, Canada and Norway. Manganese is mostly imported from Germany, Great Britain and Norway and Sweden, although it can be got in Georgia, California, Virginia and Arkansas.

Of the non-ferrous metals, aluminum is of chief importance and, on account of its lightness, it has been used wherever possible in aeroplane metal parts. Aluminum deposits are chiefly located in the United States and particularly in Arkansas and Tennessee although Colorado, California, Arizona, Nevada and North Carolina have deposits which are expected to be valuable. Aluminum alloys, such as magnalite, must also be noted. Aluminum is used wherever high resistance is not required such as in the crank case, water pump and sometimes, the rocker-arms. Aluminum pistons are also common.

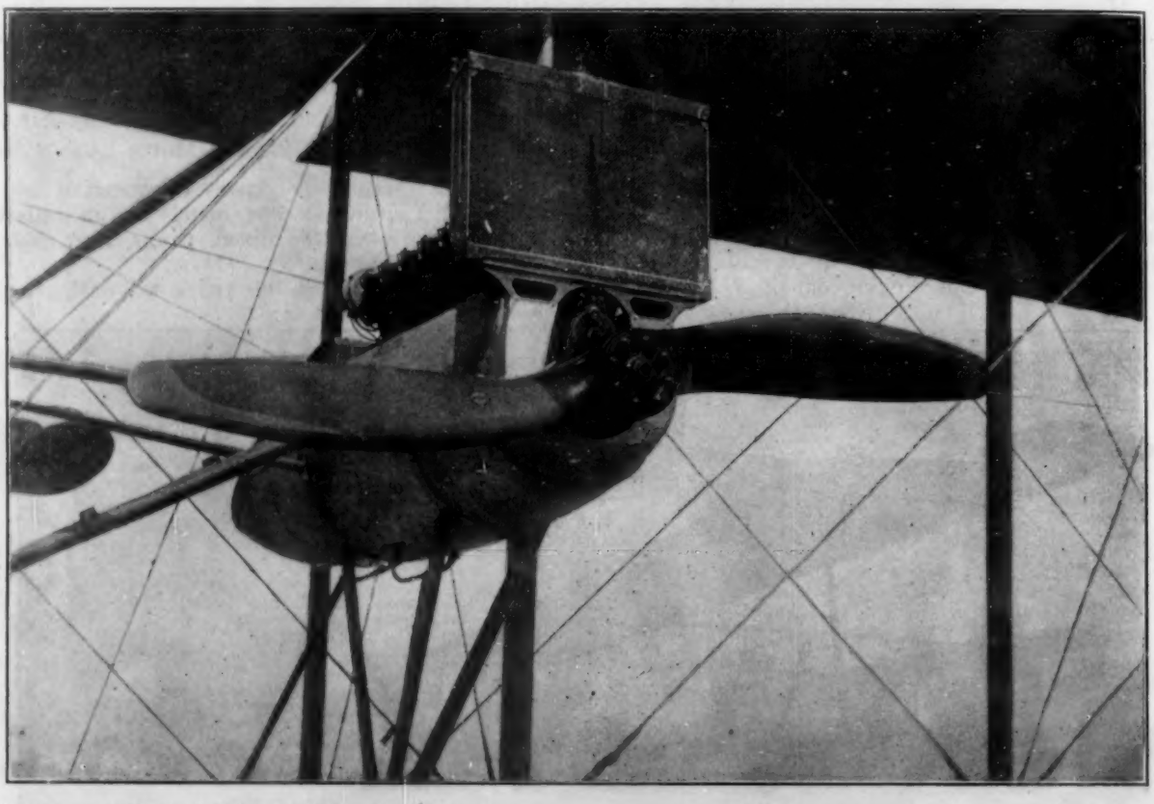

Photo by courtesy of Curtiss Aeroplane and Motor Corporation.

FIG. 2. ONE OF THE MOTORS, COMPOSED LARGELY OF METALS, THAT CARRIED THE N.C. 4 ACROSS THE ATLANTIC.

Copper and copper-alloys also play an important part in aeroplane construction. Copper itself is used for piping and sheeting; brass, an alloy of copper, tin, and lead, for washers, turnbuckles, etc. Bronze is used for pins, bolts, etc.

Magnesium is also used as a babbitt metal and monel metal. The last two named are alloy metals which require separate classification from the copper alloys listed above. Babbitt metal is used for bearings. It varies somewhat in composition but had an original formula of 88.8% tin, 7.5 antimony, and 3.7 copper. Monel metal is used where non-corrosive quality is desired. It equals in strength high grade steel castings. Its composition is 24-28% copper, 67-74% nickel, and .5-5.25% iron.

The procuring of metals for aeroplane construction

does not at present offer any difficulties. Producers are naturally looking for better materials, and every month sees in quality and kind of supplies used, but there was a time, not so long ago, when many aeroplane materials were not considered satisfactory or when satisfactory materials were known to exist but hard to get. This condition, however, pertained more to the woods used in construction than to the metals.

There was a time when the steels and irons available were of not a too satisfactory quality, but fortunately the development of high power motors and large aeroplanes has coincided with the development of high grade steels. The aeroplane industry cannot be credited with developing special grades of metal to any great extent although numerous improvements in the treatment of both steel and aluminum have been encouraged by aeroplane manufacture.

During the war, chief stress was laid upon lightness, for lightness meant speed and maneuverability—two highly-desirable qualities in a machine designed primarily for fighting. With the war-time production ended, aeroplane manufacturers, building machines for individual, commercial and pleasure uses, are sacrificing speed for safety and comfort, for they realize that these two qualities are essential before the aeroplane can hope to take its place alongside the railroad, the steamship, the motor truck and the automobile as an agent of transportation. As a matter of fact this is already being proved by the planes now being used for commercial purposes.

Photo by courtesy of Curtiss Aeroplane and Motor Corporation.

FIG. 4. NAVIGATOR LT. A. C. READ AND PILOT LT. HINTON OF THE NC-4 JUST BEFORE THE START FROM ROCKAWAY TO HALIFAX.

PRESENT STATUS OF STEEL AND DURALUMIN IN THE CONSTRUCTION OF THE FRAMEWORK OF WINGS AND EMPENNAGE MEMBERS

SOME INFORMATION ISSUED BY THE DIRECTOR OF AIR SERVICE, WAR DEPARTMENT, WASHINGTON, D. C.

Wood has so far been the favorite material for the principal structural parts of airplanes, due to its comparatively great strength in proportion to weight, and to its ability to withstand vibration better than metal. Of late, however, attempts have been made to use high-grade steels or duralumin and similar alloys for certain parts of planes. These efforts have been due partly to the shortage of suitable lumber for airplane construction, but some other considerations have entered as well, such as facility of production, especially where large

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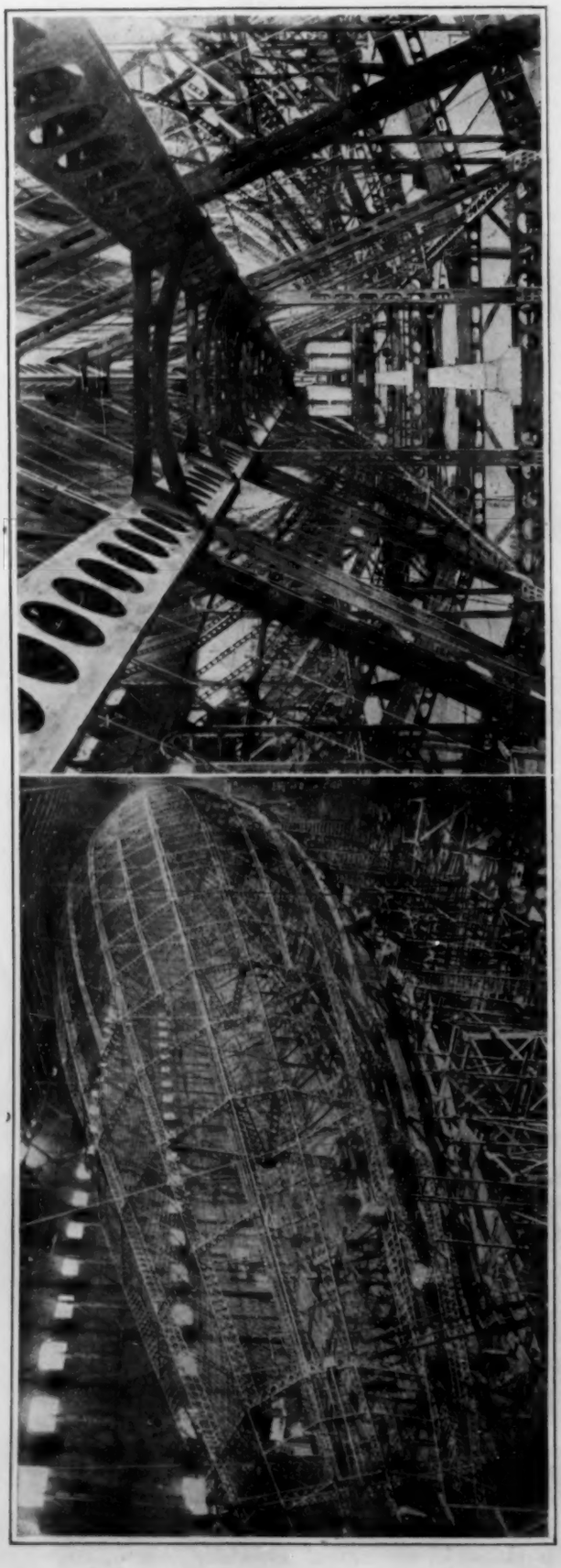
FIG. 3. THE BRITISH DIRIGIBLE R-34 WHICH RECENTLY MADE THE ROUND TRIP FROM ENGLAND TO AMERICA, BEING THE FIRST OF ITS TYPE TO PERFORM THE FEAT.



Courtesy of Scientific American. Copyright Underwood & Underwood.

FIGS. 5 AND 6.—TWO VIEWS OF THE R-34 WHILE BEING BUILT, SHOWING, RESPECTIVELY, THE HUGE FRAMEWORK OF DURALUMIN, AND "CATWALK" OR CORRIDOR IN THE BAG.

quantities of planes of uniform design are built, and the greater uniformity of the material. In some cases also it is possible to obtain with metal greater strength for equal weight, although usually this involves the development of an entirely new type of construction, as compared to that used with wood.

Eventually if it is found possible to build planes entirely of metal, the reduction of fire risk will be a strong point in favor of this construction. So far, however, metal has not been found very satisfactory for wing covering nor for fuselage framework and covering.

Wing spars and ribs of steel and of duralumin have been made very successfully. Steel has been used to advantage also in the construction of the complete frames of control surfaces, including the ailerons and all of the empannage members. In fact, in some cases all of the control surfaces of the plane have been made with steel frames, where the principal members of the cellule were of wood.

Control masts and wing and chassis struts are other parts in which steel has been used very successfully.

Metal wing coverings have not proven very satisfactory, due principally to the fact that the linen and other fabric materials now in general use are much stronger in proportion to weight than any metal wing covering so far developed. With proper design and construction the fire risk due to the use of doped fabric covering on the wings, control surfaces, etc., can be minimized, except, of course, for war-time flying where incendiary bullets must be coped with.

For fuselage construction, wood has been found much stronger in proportion to its weight than metal. It does not now seem likely that the latter material will come into general use in the construction of present day types of fuselages. A possible exception would be an armored plane intended for ground harrassment, in which the sheets of armor plate could be used to form part of the fuselage structure, thus doing away with a certain amount of framework.

Duralumin and special steels are most favored for use in airplane construction. Special steels are now being used to some extent for the frames of control surfaces, in addition, of course, to the various small parts such as strut and brace wire attachment plates, small braces, gusset plates, reinforcements and miscellaneous fittings in which this material has been used from the first.

SOME DETAILS OF THE "R-34."

According to a description given in the Scientific American for July 19, 1919, the R-34, which is shown in our cuts, Figs. 3, 5, and 6, and her sister dirigible, the R-33, were built by the British Government for the purpose of bombing German cities and naval scouting. As shown in Fig. 3, the R-34 is made up of a giant skeleton composed of duralumin, an aluminum-magnesium alloy, which is filled with nineteen gas bags. Each gas bag is placed in a compartment and separated from its neighbors by netting in order to prevent rubbing. The outside of the skeleton is covered with a taut fabric skin.

The R-34 is 672 feet long and 79 feet in diameter at her greatest girth. From the top of the cigar-shaped bag to the lowest point of her five gondolas she measures 90 feet. While these dimensions seem to mean a ship of enormous capacity, we must remember that the dirigible which has just visited us is not the largest in the world, as the Germans at the present time have larger Zeppelins in the air, and the British have larger rigid dirigibles under way. The entire cost of the R-34 is placed at $2,500,000.

Under the cigar-shaped bag of the R-34, as shown

in Fig. 3, are suspended the four gondolas which carry the crew when on active duty as well as the engines. The forward gondola contains the navigating quarters, wireless station and an engine. The other engines are located in the following places: One engine in each of the gondolas amidship and two in the gondola aft, a propeller being provided for each engine with the exception of the rear gondola, which has one propeller for two engines. The engines are of the Sunbeam Maori type, each developing 250-275 horsepower, with a speed of 2,500 revolutions per minute, thus enabling the airship to make some 70 miles an hour under favorable conditions, but under ordinary circumstances the engines are not operated at full speed and the airship floats along at 50 miles an hour in fairly still air.

DURALUMIN AND ITS HEAT TREATMENT*

ABSTRACT OF PAPER TO BE PRESENTED AT THE PHILADELPHIA MEETING OF THE AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, SEPTEMBER 29-OCTOBER 3D, 1919, BY P. D. MERCIA, R. G. WALTENBERG AND H. SCOTT.

Duralumin was developed about 1911 by A. Wilm. Its usual composition is as follows:

	%		%
Copper	3 to 4.5	Iron (as impurities)	0.4 to 1.0
Magnesium	0.4 to 1.0	Silicon	0.3 to 0.6
Manganese	0.0 to 0.7	Aluminum	Remainder

It weighs about 178 lb. per cubic foot. Its tensile strength after the proper heat treatment is from 50,000 to 60,000 lb. per square inch. It is used only in the forged or rolled condition. Its principal use is for parts where both strength and light weight are required.

The most remarkable property of duralumin is the fact that it can be hardened appreciably by quenching from temperatures below its melting point, followed by ageing at ordinary temperatures, which ageing consists merely of allowing the material to stand at these temperatures. The hardness is not produced by the quenching along, but increases during the period of ageing, which may be from one to three days. Upon annealing, the alloy so hardened is softened exactly as is hardened steel.

The authors of this paper carried on experiments in the heat treatment of duralumin, partly in the laboratories of the Bureau of Standards and partly in cooperation with the Aluminum Company of America at its laboratories at South Kensington. The conclusions are as follows:

When duralumin is cooled rapidly by quenching from temperatures between 250° and 520° C., and then aged at temperatures from 0° to 200° C. the hardness, and, at least at lower ageing temperatures, the ductility increases. The actual values of hardness and ductility thus obtained depend on the quenching-temperatures. For the best results, the quenching temperature should be between 510° and 515° C. and should not exceed 520° C. under any circumstances. Sheet material should be held at this temperature from 10 to 20 minutes. Heavier sections, such as bars, might require a longer time.

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FIG. 7. THE VICKERS VIMY BOMBING AIRPLANE WHICH MADE THE FIRST CONTINUOUS FLIGHT ACROSS THE ATLANTIC OCEAN.

Quenching is best done in boiling water, the resultant mechanical properties being better than if cold water is used. There is also less danger of cracking from cooling-stresses.

The best temperature for the subsequent ageing depends on the mechanical properties desired. For most purposes it will be best to age at 100° C. for 5 or 6 days. Such a treatment develops both high strength and high ductility. If a material having a higher proportional elastic limit, but lower ductility is desired, it may be aged at temperatures up to 150° C. for 2 to 4 days.

The authors believe that it would be of advantage to pre-heat the ingots for hot-rolling at a somewhat higher temperature than is sometimes used, say 500° C. Rolling should, however, be done at about 450°. C., as there is danger of hot-shortness if the material is rolled at the higher temperature.

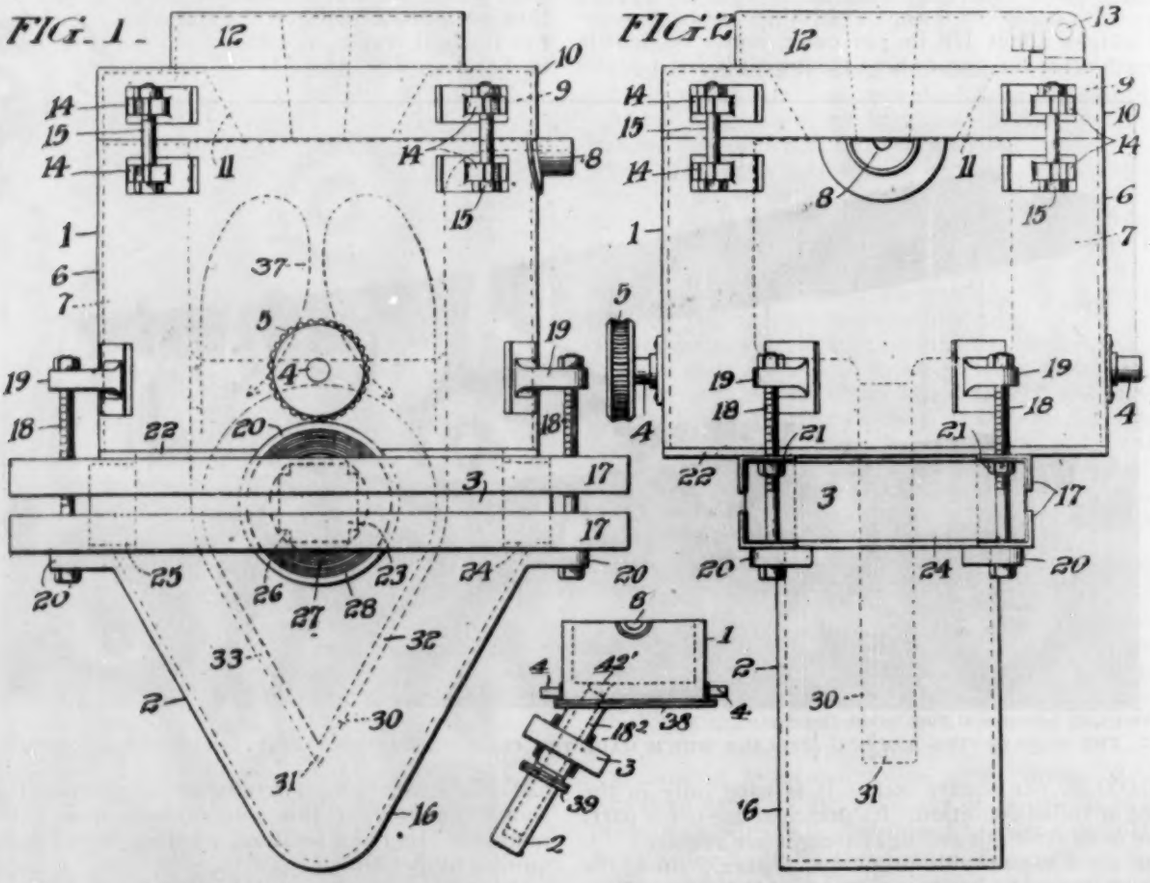
*This alloy was described in THE METAL INDUSTRY, June, 1911.

AJAX-WYATT ELECTRIC FURNACE

A Description of An Induction Type of Metal Melting Furnace Given at a Symposium on Electric Furnaces at the Boston Meeting of the American Chemical Society, June 18, 1919.

By C. H. Clamer, Vice-President Ajax Metal Company, Philadelphia, Pa.

In Figures I and II is shown one form of the Ajax-Wyatt electric furnace, having in general a body, 1, and channel portion, 2, connected therewith by a transformer, 3. These, with the closure for the body, are adapted to be rotated about trunnions, 4, in any suitable bearings by means of worm wheel, 5. The means for securing support and rotation are so well known that I have considered their illustration to be unnecessary. In this particular form the furnace body, adapted to receive a pool of molten metal and melt the pieces of metal down into it, is made up of an outer jacket, 6, lined at 7 and carrying a pouring spout, 8. The upper portion of the body is partly closed by an annular tile, 9, held in a shell, 10, and having a conical opening in the annulus in which fits a plug, 11, carried by a cover, 12, and hinged at 13. The shell, 10, is secured to the jacket, 6, by means of ears, 14, and bolts, 15. In this construction it is preferred not to connect the casing, 16, within which the lower part of the channel is formed directly with the body of the furnace, but to interpose the transformer between and form part of the channel actually within the transformer as distinguished from having the channel member merely pass through a gap in the transformer. In this way the shell type of the transformer shown is built into the unit and forms part of the mechanical protection and frame of the complete furnace, reducing the metal parts, avoiding interruption of the magnetic circuit of the transformer, in order that it may be put in place and reducing heat losses. The transformer is conveniently connected to the other parts by the use of angle irons, 17, at the top and bottom. Bolts, 18, pass through these and through cars, 19, upon the jacket and flanges, 20, of the casing, clamping the body, transformer and casing, 16, firmly together. The bolts are secured by nuts, 21, and corresponding nuts separately engage the under sides of the upper angle irons. A pair of brass spacing plates is shown at 22.

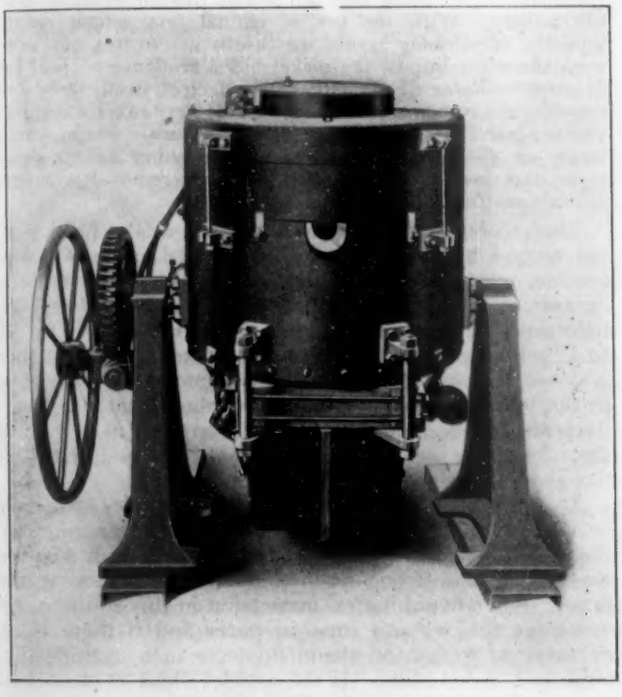


DIAGRAMMATIC SKETCH OF THE AJAX-WYATT ELECTRIC METAL MELTING FURNACE

The transformer shown is of a single phase shell type. Its laminated magnetic circuit has a central leg, 23, and end legs, 24 and 25. To accommodate a close circular winding the edges of the central leg are cut, as shown, and the winding is put on in the form of a series of layers of parallel circular bands forming a circular primary winding. In the structure used the primary winding, 27, was formed from a flat strip of conductor wrapped with asbestos insulating tape and applied in rings interrupted at the points of cross connection with adjoining rings and also cross connected from one layer to the next at the ends of the rings adjoining layers. The casing, 16, is a casting designed to engage the angle

irons on opposite edges of the lower part of the transformer and to engage the edge of the primary winding. In lining the furnace frame thus formed a two-part pattern is inserted, having the shape of the channel and pool and having a division line between the parts at some point, as 28, so that the lower part of the cementitious lining used could be placed and rammed before the upper part of the pattern can be inserted and the lower part of the pattern is put in place. Plastic material is then rammed about the form inside and out, completing the lining within the casing, transformer and body of the furnace and filling the entire space about the primary winding except the portion occupied by the pattern. The pattern, which is so made that its expansion does not crack the lining, is melted out by the current. A clay and asbestos insulating compound is used for linings—this is subsequently dried out gradually.

The channel, 30, is flattened in cross section, preferably of rectangular or approximately rectangular shape, and



THE AJAX-WYATT FURNACE.

with the longer dimension of rectangle parallel with the axis of the transformer winding. The channel length is formed with an acute angle at the turn at 31 outside of the furnace and in the turn at the pool acute angles are avoided, the contour being rounded between the connections with the pool or at least obtusely angled where the connections are made with the furnace. In the form of Figures I and II the channel meets the pool in a generally vertical direction, and on opposite sides at the outer edges of the pool, thus securing a maximum effect for the stirring action produced within the channel.

When electric currents traverse fluid conductors (such as molten fluid in the channel parts, 32 and 33), and flow in opposite directions, electro-dynamic forces are set up in the conductors in directions perpendicular to the lengths of the conductors, tending to separate the conductors. These forces vary directly as the product of the current flowing in the two conductors (as the square of the current where the same current flows in each) and inversely as the distance between the parts of the fluid affected. Where these conductors are not parallel the electro-dynamic forces vary in magnitude from one point to another along the lengths of the conductors, because of the differing distances separating them at these points, and cause correspondingly varied hydro-dynamic forces tending to produce motion of the fluid parallel to the lengths of the conductors. The application of motor effect causes motion of the fluid and circulation if the fluid be free to flow. The motor effect, due to this circulation, may be intensified by bringing the conductors together into an angle, and becomes most effective where the angle is acute, increasing within reasonable limits with the acuteness of the angle. Though Joule effect and some pinch effect is also present, the hydro-dynamic pressure due to electro-dynamic motor effect is the dominant force in the Ajax-Wyatt furnace, which not only depends generally upon this pressure for circulation of the heated metal, but gets great advantage from the intensity of the pressure in the angle where overheating would otherwise take place.

The development of the Ajax-Wyatt furnace in single phase form, having power factor of about 70 per cent, is limited to approximately 80 KW. for brass melting and 100 KW. for steel melting. This limitation is established by the size of the secondary loop. It can, however, be developed for two and three phase operation.

It is, therefore, possible to produce a brass furnace of two phase construction of 160 KW. capacity, and for steel 200 KW. capacity. The furnace can also be constructed for three phase operation. The maximum capacity of such furnace for brass being 240 KW. and for steel 300 KW. Work on the construction of two and three phase type of furnaces is about to be undertaken. Work will also be undertaken for melting ferromanganese and steel.

This furnace is suitable for direct casting into molds of small cross section. The Ajax-Wyatt furnace has thus far only been recommended and marketed for yellow brass melting. In this field it has been in very successful use for more than two years. Many million pounds of brass have been melted in them and cast into ingots, extrusion billets, flat metal slabs and tube blanks. All manner of stock has been melted in them, from solid metal to sawings and washings. The average melting rate is from 8 to 11 pounds of 2-1 yellow brass per kilowatt hour, depending on the capacity of the furnace and the nature of the charge.

The average life of the linings is in excess of 150,000 pounds. Some linings have not required replacement until well over half a million pounds have been melted. The metal loss is of course largely dependent upon the nature of the charge, but on clean solid metal averages below one half of one per cent.

The furnace requires no particular skill in operating. Intelligent unskilled labor is used entirely for this purpose.

Development work thus far has been concentrated upon the perfection of the single phase furnace for brass melting only, and in sizes of 30 and 60 KW. Standardized manufacturing methods have been worked out for these and attention will now be directed toward further development for other purposes and other sizes, and in the two and three phase forms.

TO OXIDIZE SILVER

Prepare a hot solution of polysulphide, which replaces liver of sulphur in the proportion of 2 ounces to each gallon of water, maintained at 180 degs. Fahrenheit. The silver plated articles become oxidized in a few moments. They should then be dried out, scratch brushed dry and then scored down with a slow running tampico brush and pumice stone and water mixed to a paste, and afterwards dried and lacquered.—C. H. P.

THE RE-NICKELING OF SURGICAL INSTRUMENTS

SOME RESULTS OF INVESTIGATIONS CARRIED ON IN THE MEDICAL REPAIR DEPARTMENT LABORATORY ESTABLISHED IN FRANCE DURING THE GREAT WAR.

WRITTEN FOR THE METAL INDUSTRY BY SERGEANT JOSEPH HAAS, JR.*

This article deals with the writer's experience in replating surgical instruments at the Medical Department Repair Shop in France. The writer had previously had no experience in replating work, except the little that would occasionally go bad in a manufacturing plant, and then the work was of such a nature as to allow striking in the cyanide copper solution. However, copper plating of the instruments was not permissable.

The work was previously immersed in potash and then scoured with a paste of pumice stone and lime. This method proved satisfactory during the war, as the quantity of work handled was very small, but with the advent of the armistice, instructions were issued to all base and field hospitals and also to the medical units that as soon as they completed their work the surgical instruments were to be sent to the Repair Shop, the latter being ordered to repair all instruments. The difficulty of keeping up with the polishers by using the scouring method was then encountered.

I will give a little description of the condition of the instruments that came in to be repaired. Some of the articles came in with very little rust, while others were almost entirely covered. However, the rust was of such recent origin that it was neither deep nor hard, and by rubbing the instrument over a 150 emery polishing wheel the rust was removed. The articles were then brushed and sent to be nickel-plated practically all over, except for a few spots of steel here and there which were left exposed. Consequently the polishers with but two operations to accomplish were able to pile up the work on the plating department. It was evident then that a new method of preparing the work for plating had to be adopted, not only because of the amount of work that was required to be done, but because scouring is a slow and tedious operation, especially if one has to do it all day long. Inexperienced help was also put in the plating room to do the scouring, and as they did not like the work any too well, they were particular not to rub too hard for fear of wearing away the metal. The nickel surface is very difficult to clean, but if the surface is not clean it is impossible to produce a heavy nickel deposit. The instruments were plated for one hour at 1.75 volts, and approximately 12 amperes per square foot, but, as mentioned above, the work was cleaned by inexperienced help and the work peeled.

The difficulties encountered in nickel plating direct on a nickel deposit were: 1. The impossibility of obtaining a heavy deposit, unless the articles were carefully and laboriously scoured. The peeling also appeared where the nickel had been deposited rapidly, that is, parts facing the anodes and also on the bottom of the articles. 2. While the articles did not give any evidence of peeling when removed from the tank, the immersion into hot water would bring out the faulty deposit. However, none of these difficulties were experienced if the writer did the scouring himself, but this had become impossible, as others had to help in order to make any headway.

Langbein says:—"Defective nickeling must, as a rule, be completely removed before the objects can be re-nickeled, since the second deposit does not adhere to the previous deposit, but frequently peels off in polishing or by slight bending of the object. The reasons for this behavior are:—1. Like iron, nickel readily oxidizes on the surface, but this oxidation is not so heavy as to be perceptible. Previous to nickeling this oxide has not been completely removed, and in the case of quite old plated objects the nickel has had a chance to oxidize. As nickel only adheres firmly to metallic nickel and not to the oxide, hence, the second deposit peels off. 2. In case the deposit is comparatively new and has not been exposed for some time to the action of atmospheric conditions, then the peeling of the nickel is as a rule due to the polishing material remaining on the surface. Vienna lime and similar compounds which contain paraffin, fats, waxes, etc., are used quite extensively for polishing nickel. These substances partially penetrate into the pores of the deposited nickel or remain on the surface. By the ordinary means of cleaning the mineral oils or wax are not removed, the consequence being that the second deposit of nickel does not adhere. With the use of animal fats, which readily saponify, as polishing agents, the case is not so bad, but under even these conditions, the nickel has a tendency to peel off. It must be borne in mind that—all electrolytically produced deposits are composed of a net-work of very minute crystals, the deposit thus being of a porous nature. In polishing, larger or smaller quantities of the polishing agents penetrate into these pores and their complete removal is a very difficult matter."

The second explanation of the cause of the peeling of the second nickel deposit as given by Langbein is untenable, whether the polishing materials contain mineral or animal fats. For instance, take a batch of steel articles and leave them immersed in boiling potash for 10 to 15 minutes, remove and rinse in water. Observe then whether the water denotes the presence of grease, and in the majority of cases it will be found that the water does not break. Then immerse the articles in a cyanide dip, rinse in water and give a heavy plate. Even after the above the deposit will be found to peel.

As another example take some brass articles that have been nickel plated, but cut through to the brass here and there. Immerse these brass articles in a potash solution that is not too strong and which will not discolor the brass. After five minutes' immersion in this solution, remove the articles and rinse in water and if there is no evidence of grease on them, immerse in a cyanide dip, rinse and nickel plate. If the articles show evidences of grease after rinsing in the first water, a momentary immersion in the potash will remove it. The same as with the steel, the deposit on the brass articles will also peel.

The explanation for the lack of the appearance of grease may be based upon two reasons, the first of which is that by soaking the articles in the potash the grease is either removed by saponification if it is animal fat, and second, if it is mineral oil, the pores of the metal being opened up in the hot potash some of the grease leaks out into it and the remainder is removed when the articles are plunged into cold water, causing a sudden contraction of the pores. If grease should make itself evident upon rinsing in water, the momentary immersion into potash again will remove it. The complete removal of any kind of a fat can be determined by taking articles and soaking them in paraffin and stringing them on wire and then soaking in potash for 10 to 15 minutes.

By employing the following method the writer has not been troubled with evidences of grease on articles to be plated:

1. All steel work allowed to soak in the potash 10 to 15 minutes.

*Mr. Haas is now back in this country after serving eighteen months in the Overseas Surgical Instrument Repair Unit with the American Expeditionary Forces in France.

2. All brass work allowed to soak 5 minutes.

3. Articles removed from potash and rinsed in water, and if the water breaks, a momentary dip in the potash to remove the grease.

4. Re-immersion in water. At this point grease has never shown itself.

As a consequence then it is evident that the cause of the peeling of the second nickel deposit is to be sought elsewhere whether or not the articles have been exposed to the air. Langbein's first explanation is the best, namely the oxidation of the nickel, and as far as I can remember, this explanation has also been given by other writers. This oxide, to a slight degree, may be formed by the atmosphere if the articles have been exposed to it for any length of time. Also it is probably the formation of an oxide that causes the dulling of a nickel surface that has been exposed to the air for a long time. There is an oxide of nickel known as nickelo-nickelic, that is gray in color and I believe that it is this oxide that is formed as it better fits in with the bluish-white nickel, while the other oxides of nickel are either black or green, and would, therefore, be perceptible whereas the grey oxide is not.

However, the probable cause of the oxidation is not to be looked for in the action of the air, but in the action of the potash on the nickel surface. It will be observed that if a nickel plated article is left to soak in the potash for a short time that a greyish cloud will be formed which would explain the peeling of articles which have not been exposed to the air for any length of time. If the articles are immersed in acid the nickel will resume its former bright appearance. Nickelo-nickelic oxide (Ni_3O_4) is soluble in acids.

As I was then convinced that the cause of the difficulties was due to the oxidation of the nickel and that the oxide could be removed by acids, the solution of the problem was in view. The first thing I tried in this line was the method recommended by Emmanuel Blassett in an article "The Deposition of Nickel on Nickel," which appeared in THE METAL INDUSTRY for September, 1912. The method consisted of using a concentrated solution of muriatic acid, with carbon as the anodes and the articles as the cathode, as an electric cleaner. The solution consisted of 10 parts of hydrochloric and 2 parts of water. The method worked well but for the fact that the acid atacks the copper suspending wires and caused the steel to be coppered, but the main objection was the continual presence of the odor of chlorine gas, which is neither pleasant nor healthy. For this resaon this solution was discarded. After going over the actions of the various acids on steel, copper and brass, it was decided that the best acid was sulphuric acid. Sulphuric acid when concentrated has a negligible action on copper or brass, especially where momentary immersions are to be considered. In diluted form its action on copper and brass is also very slight. Steel is readily acted upon by sulphuric acid, but where momentary immersions are used same may be negligible. Nickel is but slightly acted upon by this acid.

The following method was then employed: The articles after being cleaned in potash, as already mentioned, were immersed in concentrated sulphuric acid, rinsed in water and plated in the nickel solution under current conditions previously mentioned; that is, only articles of brass were done in this manner. The resulting nickel deposit was very satisfactory. As the steel articles retained on their surface emery from the brushing operation, it was decided to try an electric cleaner of sulphuric acid to remove it. However, in waiting to determine the best method of using this cleaner, the steel articles were finished as follows: Mopped off at the potash tank, rinsed in water and then dipped in the concentrated sulphuric acid, rinsed and then put in the nickel solution, and a satisfactory nickel deposit was produced.

The sulphuric acid electric cleaner, which was found after several trials to be the best, consisted of the following:

Water .....20 gallons,
Sulphuric acid .....100 fluid ounces.

This solution was contained in an earthen ware tank, using anodes of sheet lead, which were suspended from the positive rod by a copper hook which was not allowed to dip into the solution. The sulphuric acid solution acts as a decomposer of nickel oxide and by the evolution of hydrogen gas at the cathode removes emery adhering to the articles. The brass is not run into this solution, but is dipped into the concentrated acid, rinsed and then nickel-plated. The electric cleaning solution is operated with approximately 15 amperes per square foot of surface at 4 volts and the articles are allowed to remain in the cleaner from 3 to 5 minutes.

There are many platers today who insist on giving their steel articles, that have not even had a first coating, a little scouring first as they claim that the nickel sticks better, but I believe that by employing the above-mentioned solution for cleaning new articles that they would save considerable time in preparing the work for plating.

METAL FLUTES

Metal men who are music lovers and who attend concerts of large orchestras may have noticed that the reed instruments, which were formerly made of wood, are now being produced in metal. At some of the concerts given in New York City it is noticeable that all of the flutes are of a shiney, silvery metal and in order to find out what was the progress in the manufacture of metal orchestral instruments THE METAL INDUSTRY inquired from one of the prominent instrument makers in the United States—C. G. Conn, Ltd., Elkhart, Ind., and received the following reply:

NEW WONDER METAL BODY BOEHM SYSTEM FLUTE.

"Sometime ago, owing to the scarcity of the right kind of wood for making flutes, manufacturers looked into the possibility of producing metal flutes. Many experiments were made with the different mixtures to ascertain which alloy would produce as fine a tone as a flute of wood. At last it was determined that nickel-silver gave the desired musical tone and in order to have the instruments appear more attractive they were plated with coin silver or gold."

The makers state that a flute on which is put a heavy gold plate including the springs and keys, with the addition of having the keys inlaid with pearl, is a very handsome instrument.

C. G. Conn states that metal flutes are superior to wood in the respect that they do not crack or check under variable weather conditions nor from the quick changes of temperature of hot to cold.

The metal flutes and piccolos have been carefully tested by the Government for use in the army and navy bands and were found to be the best instruments of their kind on account of their good tone, appearance and the fact that they can be used in any climate in the world.

MANUFACTURING COST SYSTEMS

AN ARTICLE DEALING WITH THE ECONOMIC PRODUCTION AND CONSEQUENT EFFICIENCY IN OPERATION OF A METAL SHOP.

WRITTEN FOR THE METAL INDUSTRY BY M. H. POTTER.

There should be no argument as to the necessity of a well formulated and accurate system for ascertaining the actual costs of the product. The so-called cost systems in many manufacturing establishments of the present day have grown out of the old-time methods of commercial bookkeeping, to which has been added from time to time, a card, or blank, for this detail or that, with no general plan to guide.

An efficient cost system should work to the advantage of both the shop and office. In fact, it ought to have a beneficial effect upon the sales department as well, thus increasing the efficiency of the administrative, the manufacturing, and the selling of the product.

The requirements of a good cost system are quite definite and important in the management of a manufacturing enterprise as well as in the duty of accurately accounting for the cost of the work. The most prominent of these requirements are as follows:

To give, within a reasonable time after the work is completed, the actual and complete costs, including every item of expense to the owner of the plant, of the operation of the plant as a whole; of the operations of each department of the plant; of the cost of each operation, and the cost of each machine part; of the cost of assembling the groups of related parts; of the cost of erecting the completed parts; of finishing, testing, and shipping it, and the cost of advertising it, and selling, or marketing the product.

It should tend toward the closest economy in the purchase of all material, and in the care, issue, accounting for, and use of it.

It should secure the greatest economy of the wages paid for labor, not through lowering wages, but through increasing the efficiency of the workmen by accurately accounting for their work and providing for special remuneration for special individual effort and efficiency.

To decrease the cost of all manufacturing operations through accurate records of past and present performances, and their logical analysis and comparison, by which improved methods may be formulated and the efficiency of men and machines secured.

To increase the volume of output of the concern by means of the economies mentioned in the last paragraph, whereby the increase of efficiency, the shortening of the time necessary to do the work, and the decrease of costs have combined to largely increase the producing capacity of the plant.

To increase the profits of the concern by reason of the fact that costs of all parts of the work having been accurately determined, correct estimates may be given with confidence, and closer figures may be made upon proposed work than is possible with a rival firm not so accurately informed as to costs, whereby the concern stands upon a better basis in getting new business. Losses are also avoided, as an accurate knowledge of costs shows the manager what work to avoid as unprofitable.

The cost system must not only show a correct record of all manufacturing operations and all fluctuations of costs, but it must show why these fluctuations have occurred and fix the responsibility, first, upon the proper department, and, second, upon the official or individual who may be held responsible.

There is a close relation between the cost system, the shop methods, and the commercial accounts. The cost system and the shop methods must not only work in harmony with each other, but, also, with the general accounting system of the concern, so that each may assist and support the other in attaining that success which comes from the union of effort on the part of all concerned.

While some of the results here enumerated are not exactly within the province of the cost system, and belong more particularly to the work of shop management, these two branches of the work are so interwoven with each other that it is not practicable to discuss the one without including the other.

In inaugurating a cost system there are certain calculations to be made as to the fixed charges or expenses that are of the utmost importance, and without which it is impossible to formulate a complete or accurate system of cost accounting. It is not sufficient to say that there are commercial costs with which the manufacturing department have nothing to do, but which will be properly taken care of by the bookkeepers. It is not possible to obtain accurate costs of manufacturing operations, and properly distributed as commercial charges after the product is turned out.

Interest, taxes, insurance, and like charges are as properly a part of the cost of manufacturing as the wages of the workmen, or the cost of material.

Machines vary greatly in first cost, hence there is much difference in interest charges. They also vary in a similar degree as to power to drive them and the cost to house them, hence in the real estate and similar charges properly assessed against their operation and output.

There are many other and equally good reasons why all these expenses should be taken into the accounts of manufacturing operations at the earliest possible moment.

By accurate accounting for manufacturing operations is not meant simply all the expenses of a department as compared with all the output of that department. Costs should be in detail and not only cover an order for a machine, but the cost of its several parts, and if a portion of a regular production order, we should have the costs of the different operations on the parts, and also the cost of assembling the groups of related parts and that of erection and finishing. Therefore we should arrange the plan for the general accounts and work out the necessary calculations before entering upon the detailed work of the plan. The classification of accounts will be as follows:

Real estate, power, lighting, heating, shop transportation and all tools and fixtures, attachments and fixtures made and used upon a certain machine are considered a part of that machine and added to its value. Regular hand tools, as drills, reamers, taps, dies, etc., are a part of the shop equipment and the interest on their cost, plus the expense for maintenance and renewals should be added to the general expense.

Materials, including all raw and manufactured materials and supplies, purchased parts, whether in the rough, partly or completely finished, which are directly to the product. It will require space to store this material, men to handle, issue, and account for it, these expenses be-

come a part of the general expense account and are charged as overhead burden.

Non-productive labor. Wages of all employes not working directly upon the product.

General office. Real estate, interest on furniture and equipment; maintenance and renewals, lighting, heating and all miscellaneous expenses in this connection.

Machine rate. Made up for each machine. Interest, depreciation, according to the kind of machine, class of work, and hours used per week. Maintenance, renewals and repairs. Floor rate, including space occupied by the machine and the space necessary for handling its work. Power for operating the machine. The sum of these expenses for a month to be reduced to an hourly rate.

Man rate. Includes, floor rate, consumable tools and supplies. The floor rate chargeable to each man is to be computed as follows: From the entire area of floor space subtract the amount assigned to machines plus that occupied by the power plant. Divide the remainder by the number of productive men. This method will place the proper burden upon such departments as the assembling room, which contains few and often no machines. The amount so determined is reduced to an hourly rate to be charged as a burden to all productive

STOCK PRODUCTION ORDER

NO.____ DATE ____

MAKE FOR STOCK THE FOLLOWING MACHINES, ATTACHMENTS, TOOLS, FIXTURES

QUALITY	DESCRIPTION	SIZE

TO BE COMPLETED	REC'D IN FACTORY
ORDER COMPLETED	FACTORY MANAGER

FIG. 1. GENERAL PRODUCTION ORDER SLIP.

labor. The rate is assessed separately to the departments equipped with machines of varying numbers and sizes, or with no machines at all.

Productive labor, wages of employes working directly at hand or machine operations on the actual product or output of the plant.

The sales department, while connected with the general office, is an entirely separate matter in relation to its accounts, in consequence of its work being that of marketing the product, and its expenses are entirely commercial expenses rather than manufacturing expenses. It must bear its proportion of the real estate charges of the general office building according to the space occupied by it, and its entire expenses are distributed as a percentage over the product after it is completed and ready for the market.

Actual manufacturing operations begin with ordering the work into the shops. In every well conducted plant there should be nothing commenced until definite, written orders, regularly issued by competent authority, have been received. These orders should specify exactly what is to be done, and generally give a time limit for completing the work. In cases where a lengthy description is necessary and cannot be written on the regular order blank, reference should be made to specifications and drawings, or both, attached to the order and forming a part of it. There should be nothing left indefinite or about which a doubt or question may arise in the future as to the precise nature of the work described.

The form of these orders is as follows: General production order, Fig. 1, issued for making a specified lot of machines for stock. In the line, "machines, attachments, tools, fixtures," such words as are not required

GEN. ORDER NO.____

SUB-PRODUCTION ORDER STOCK DATE ____

SERIAL NO.____	PIECE NO.____	DRWG. NO.____	TO BE COMPLETED

QUANTITY	DESCRIPTION

COMPLETED ____

FIG. 2. A SUB-PRODUCTION ORDER BLANK.

are to be erased by drawing a line through them. They are serially numbered and dated. When necessary a date may be given for their completion, or for the completion of certain parts, or groups of parts, and the balance at a later date. The date, "received in factory," will be the beginning of the time limit for completion, in case it has been given as "30 days," "3 months," etc. This electrolyte; but of course will be different from that value order is to be made in duplicate, one copy of which is

SPECIAL PRODUCTION ORDER

NO. ____ DATE ____

MAKE FOR ____ ADDRESS ____

THEIR NO.____	THEIR DATE ____	TO BE SHIPPED ____

DATE COMPLETED ____ FACTORY MANGER

FIG. 3. A SPECIAL PRODUCTION ORDER FORM.

sent to the factory manager, and one copy sent to the engineering department, so that the necessary drawings may be furnished.

The order when received by the factory manager will be entered in his order book and sent to the production engineer, or official in charge of the planning department, in which all orders for work, drawings, shop operation cards, etc., are issued. This official will issue the sub-production order card as shown in Fig. 2. This order gives the general order number by which this particular work or operation will be identified. It may be issued by a large number of small parts, which are to be made and turned into the finished parts storeroom,

from which they may be drawn on requisitions for assembling of erecting, or it may be issued for the making of the number of parts required for the general production order whose number it bears. Several sub-production orders may be issued for work in different departments on the number of the one general order. The blank lines to be filled in this order explain themselves. A similar form is used for assembling, erecting, etc., except that different colors are used, and duplicates are filed in the office issuing them. But caution should always be used lest too many blanks are used and confusion result, as it is much better to make one card or paper blank do as many different things and perform as many different services as possible, even through different departments, each of which may add the necessary endorsement and pass it along. When so used the blanks may need to be of larger dimensions and have appropriate spaces for the several endorsements of the departments through which they may pass.

When a special machine, attachment, fixture, etc., is to be built a special production order of the form shown in Fig. 3 should be used. This order is handled in a similar manner to the stock production order, sub-production orders being issued to the various departments concerned. Usually specifications or drawings, or both, accompany it.

REQUISITION FOR SUPPLIES

REQ. NO. _____ DATE _____

FOR THE _____ DEPT. _____

STORE-KEEPER:- ISSUE THE FOLLOWING ARTICLES FOR USE IN THIS DEPARTMENT

QUANTITY	DIMENSIONS	DESCRIPTION	VALUE	

TO APPLY ON ORDER NO. _____ FOREMAN

ISSUED _____ REC'D THE ABOVE _____

FIG. 4. REQUISITION FOR SUPPLIES BLANK.

For such work as the operation of the plant, maintenance and renewal of equipment, maintenance and renewal of real estate, etc., orders under the general name of plant orders are issued. They have written or printed upon them the particular work that each class covers, and should be of a distinctly different color from production orders. In numbering all general orders are in one series. This serial number is placed on all sub-production orders and a serial number for the particular class added. Or, the general serial number may be used with a symbol of one or more letters prefixed, as X for experimental work, R for repair work, etc. It is sometimes convenient and practical to prescribe limits for the use of serial numbers. For instance, general production orders may be numbered from 1 to 2,000; plant orders from 2,001 to 5,000, and sub-production orders from 5,000 up.

All orders, when the work called for by them has been completed, will be returned to the official issuing them unless there is a specific instruction to the contrary.

All material is drawn from the storeroom whether actually in that room or stored elsewhere, but accounted for as in store. This will include castings and similar rough stock, as well as purchased parts and small materials, and from the finished parts storeroom the parts manufactured in the plant. Fig. 4 shows the form for a requisition for supplies card. It will cover all classes of material and supplies. For convenience these cards may be of different colors for the different departments. A carbon copy should be retained by the official signing them, and the original, with the storekeeper's report thereon, sent to the cost clerk. This report will give rates and values of the material issued.

In inaugurating a new cost system, it should be remembered that the first duty is to make a careful examination of the plant in general and of each of its departments, and the methods of manufacturing and cost accounting, as well as of the general and subordinate offices and their existing systems. This examination should be made by an experienced man, who should make a careful study of all conditions so as to be able to formulate plans and so co-ordinate them as to produce the best results with the least cost and without undue friction between the managing officials and the departments, or between the different departments forming the plant. The importance of this examination, the carefulness with which it is made, the thorough and painstaking study of its conditions and elements, and the accurate deductions made therefrom will in a great measure determine the success of the cost system that is finally decided upon.

GRINDING-WHEELS.

When grinding-wheels are received in good condition, carefully handled, and properly installed and operated, they are reasonably safe. To make sure that wheels are reasonably safe, see:

That they are sound and free from cracks or flaws.

That they are not operated at a higher speed than recommended by the manufacturer.

That they do not fit too tight or too loose on the spindle.

That the flanges clamp the wheel at the outer edge of the flange. (The flanges should be 'relieved' in the centre, leaving a bearing surface about three-fourths of an inch wide around the outer edge.)

That the inside flange is secured to the spindle.

That a washer of blotting or other soft paper is installed between the flanges and the wheel.

That the diameters of the flanges are the same and between one-third and one-half the diameter of the wheel.

That the wheel runs true and in balance.

That the spindle-bearings are neither loose nor so tight as to cause heating.

That oil does not work out on the wheel.

That the nut tightens in the direction in which the wheel revolves.

That the wheel is protected with a guard which would retain it should it burst.

That the arbor-ends and nuts are guarded.

That the belt is guarded at the pulley-contact.

That the tool-rest is securely adjusted close to the wheel surface.

When first starting a grinding-wheel stand to one side for about half a minute, as this is the time when wheels are most likely to burst.

Wear goggles when grinding.—National Safety Bulletin.

METALLURGICAL CALCULATIONS

AN ARTICLE DEALING WITH THE CONDITIONS THAT GOVERN SIZE AND TYPE OF MELTING APPLIANCES.

WRITTEN FOR THE METAL INDUSTRY BY ADOLPH BREGMAN, METALLURGICAL ENGINEER.

MELTING METALS WITH OIL

It is most interesting to note that a large number of metal melting plants are built and for that matter run without any clear idea of how much fuel is used or how much air is needed. A furnace is bought which is "guaranteed" to give so many heats per day of so many thousand pounds each. The furnace may be supplied with one or two burners, wholly inadequate to supply the necessary oil or air needed. The oil and air supply are not figured on as they should be, hence the furnace does not do its duty, not because of any faults in design or construction but simply because it is not given a chance. A little preliminary figuring will often save expensive changes and rebuildings. It is an old story that it is far cheaper to change the plant on paper before it is built than after.

To take a definite problem. Given a furnace which must melt 2000 pounds of copper and turn out four heats per eight hour day. This will call for a heat every two hours, including charging and tapping. The time taken for these operations should be deducted from the melting time. Figuring about a half hour, this leaves one and a half hours for actual melting time.

First, it is necessary to figure the theoretical amount of heat necessary to melt the metal.

Let A=number of pounds of metal
Let B=the specific heat of the metal
Let T=the temperature of the metal before charging
Let T_1=the temperature of the metal when ready to tap

The theoretical B. T. U. necessary to melt a charge can be figured from the following formula.

$$\text{B. T. U.} = A \times B \times (T_1 - T)$$

In this particular problem A =2000, B = .095. T can be taken as ordinary factory temperature, let us say 60°. The melting point of copper is about 1940° F, but for practical results the temperature required is much higher in order to offset the necessary losses due to cooling when tapping. The general temperature requirement is from 2500° to 2800° F. Let us take in this instance 2700° F.

$$\text{B. T. U.} = 2000 \times .095 \times (2700\text{—}6^\circ) = 501600.$$

Theoretically, therefore, it takes about 501600 B. T. U. to raise 2000 pounds of copper to a temperature of 2700° F. Under practical working conditions, however, it is quite another matter. 501600 represents the necessary heat units if the furnace is 100 per cent efficient, but as a matter of fact, very few furnaces are more than 15% efficient. The general run are close to 8 or 10% . In this instance I shall take the first figure and make further allowances later.

$$\frac{501{,}600}{.15} = 3{,}344{,}000$$

The actual heat units required will be 3,344,000 B. T. U.

The oil required to produce the above amount of heat can be figured as follows:—

$$\frac{\text{Total B. T. U. required}}{\text{B. T. U. per gallon of oil}} = \text{No. gallons oil required}$$

$$\frac{3{,}344{,}000}{140{,}000} = 23.9$$

We have then the result of about 24 gallons of oil necessary to melt 2000 pounds of copper. This is equivalent to about 12 gallons of oil per 100 pounds of metal, which experienced furnace men will recognize as a fairly general figure for an excellent furnace. To be perfectly safe, however, this figure should be raised. Most furnaces do not operate at 15% efficiency. If we should take 8% as our basis the result would be quite different.

$$\frac{501{,}600}{.08} = 6{,}270{,}000 \text{ B. T. U.}$$

$$\frac{6{,}270{,}000}{140{,}000} = 44.8$$

At 45 gallons for 2000 pounds it takes 2.25 gallons of oil for 100 pounds of metal. Most furnaces will require between 1.25 and 2.25 gallons of oil for 100 pounds of metal. The figure chosen depends entirely upon the design of the furnace.

According to the conditions of the problem, this charge must be melted in 1½ hours. In other words, (taking a mean figure of 40 gallons of oil) we must supply about 27 gallons of oil per hour to the furnace. That is an easy matter so far as the pump is concerned; almost any pump, however small, will supply this quantity. The only point is to choose the correct type of pump but as this article deals only with calculations, I shall not take up that topic other than to say that in my experience I have found the triplex plunger pump the most satisfactory. It delivers the oil at a constant pressure and without the disadvantage of churning it and forming gas pockets.

The burners, however, must be carefully chosen for size and for capability of adjustment. They must be able to handle the necessary quantity of oil and to burn it completely. Merely spraying oil through an orifice in any quantity will not suffice. There must be complete combustion.

The next question is that of air. How much air is necessary to burn the 40 gallons of oil? A good general figure to use is 2000 cubic feet of free air at normal temperature (about 60°) per gallon of oil but it will be of interest to show how this figure is obtained.

For purposes of calculation, let us consider air at the temperature of 0° C and pressure of 760 mm, or in more familiar units, 32° F. and 30″ pressure.

We know the common chemical reactions:

$$\text{No. 2 } {}_2H + O = H_2O$$
$$\text{No. 1 } C + O_2 = CO_2$$

In reaction No. 1, from the atomic weights, $12 + 2 \times 16 = 44$. That is 12 parts, by weight, of carbon will combine with 32 parts, by weights, of oxygen to form 44 parts of CO_2. In the same way as shown in reaction No. 2, two parts, by weight, of hydrogen will combine with 16 parts of oxygen to form 18 parts of H_2O. Or, one part of carbon calls for 2.67 parts of oxygen, and one part of hydrogen calls for 8 parts of oxygen. Oxygen, however, is only 23.1% of the air, by weight, or about $\frac{1}{4.33}$. Therefore, one pound of carbon will require $2.67 \times 4.33 = 11.55$ pounds of air;

one pound of hydrogen will require $8 \times 4.33 = 34.64$ pounds of air.

All that is necessary to know, then is the chemical composition of the oil used. A fair average for ordinary crude oil is about carbon 85, hydrogen 12. The remaining constitutents, sulphur, nitrogen, etc., need not be considered here.

Let C = percentage of oxygen
Let H = percentage of hydrogen
Let A = pounds of air required

$A = 11.55 \times C + 34.64 \times H = 11.55 \times .85 + 34.64 \times .12 = 13.97$ or almost 14 pounds. As there are about 7.5 pounds of oil to the gallon, the weight of air necessary to burn a gallon is $14 \times 7.5 = 105$ lbs.

The weight of a cubic foot of air, at sea level, at 32° F. and 30" pressure is 1.293 ounces or .0807 pounds. At 60° F., however, it weighs .076 pounds. This figure can be obtained from the formula.

$$W = .080728 \times \frac{P \times 491.6}{14.6963 \quad T \times 459.6} \quad \text{(From Kent.)}$$

W = weight of cubic foot of air
P = barometric pressure in pounds per square inch
T = temperature in degrees F.

In other words, one pound of air at 60° F. will have a volume of 13.14 cubic feet. Therefore, the volume of air required to burn one gallon of oil is

$$105 \times 13.14 = 1380 \text{ cubic feet}$$

This figure represents the theoretical volume of air necessary to burn one gallon of oil. In actual practice, however, it takes from 10% to 20% more air to do the work. In order to be quite safe, one should allow 200 cubic feet of free air at ordinary temperature for every gallon of oil to be burned.

To return to the problem. We are to use 27 gallons of oil per hour. That means that we shall need.

$$27 \times 2000 = 54{,}000$$

cubic feet of air per hour or 900 cubic feet per minute. The blower must be of sufficient size to handle this capacity.

A few words of caution. There is no fixed oil or air pressure for all burners. That can be determined only by the needs of the particular burner used. My personal preference is for the mechanically atomizing burner which uses a low air pressure. This will call for oil at from 40 pounds up and air at from 8 or 10 ounces up to 16 ounces. These pressures must obtain at or very close to the burner. If the piping is very badly laid out pressure will be lost all along the line. The only way to know is to have air and oil gauges located close to the burners.

It is excellent practice to preheat the oil to a temperature of about 20° or 25° below the flash point. When using heavy crude oil it is absolutely necessary. Air also should be preheated to the temperature of the oil. It must be remembered, however, that if the air is heated due allowance must be made for its expansion and the consequent dilution as regards the proportion of oxygen. This can always be calculated from the formula used above (taken from Kent). In addition, the air, especially at low pressures, loses much of its pressure if it has a long travel. Make the bends in the air piping of as large a sweep as possible—never less than three times the diameter of the pipe, and better still, eliminate all avoidable bends and elbows.

PLATING CALCULATIONS

Some Information Whereby the Plater Can Estimate Thickness of Deposits.

Calculation of Thickness of Deposits.—It is easy to calculate the thickness of the deposit from the amount of metal deposited, assuming that the metals are deposited, exactly in accordance with Faraday's law. If, for instance, a current of 10 amperes is passed on the square foot of cathode surface, then copper, nickel and silver are deposited in the proportion of their chemical equivalents, viz., 31.8, 29.3, 108, respectively. If these metals had the same specific gravity, *i.e.*, if equal weight of the metals occupied equal volumes, then these equivalent weights spread over equal areas would produce deposits of equal thickness. However, this is not the case, as the specific gravity of the metals vary, being 8.8, 8.3, 10.5, respectively. The higher the specific gravity (or the heavier the metal) the less is the volume occupied by a given mass. The volumes occupied by the chemical equivalents in grames are:

$$\text{Copper} = \frac{31.8}{8.8} = 3.6 \text{ c.c.}; \quad \text{Nickel}, \frac{29.3}{8.3} = 3.5 \text{ c.c.};$$

$$\text{Silver}, \frac{108}{10.5} = 10.3 \text{ c.c.}$$

Now, 26.8 ampere hours deposit the gram equivalent, and, therefore, deposit 3.6 c.c. of copper; 3.5 c.c. of nickel; and 10.3 c.c. of silver, in the proportion of 1 copper, .97 nickel, 2.86 silver. Hence, if spread over the same surface, the thicknesses of the layer would have the same proportions, and therefore, if deposited quantitatively, the same current density yield deposits of nickel and silver .97 and 2.86 times, respectively, as thick as that of copper from the acid bath.

Thickness of Copper Deposits.—Assuming a current density of 40 amperes per square foot, find thickness of deposit of one hour.

Total amount of copper deposited $= 40 \times 1/16 \times 11.82 = 47.3$ grams.

If to represent thickness of deposit, we get:

1 cu. inch $= 12 \times 12 \times t = 144t$ cu. inches.

Now, 1 cu. inch = 16.4 c.c., and 1 c.c. copper weighs 8.9 grams.

∴ 1 cu. inch of copper weighs $16.4 \times 8.9 = 146$ grams.

∴ 144 t cu. inches weigh $146 \times 144 \times t = 21{,}000t$ grams.

Hence, $21{,}000\,t = 47.3$ and $t = \frac{47.3}{21{,}000} \times .00225$ inch.

Similarly, a current density of 20 amperes per square foot would give a thickness of $\frac{1}{2} \times .00225 = .001125$ inch per hour. Hence to produce a thickness of one inch per hour, it would require a current density of $.001125 \times 20 = 17{,}700$ amperes per sq. foot.

Although this figure is outside the range of practicability, we can obtain some useful figures. Thus in one hour: —

177 (nearly 180) amperes per sq. foot give a deposit 1/100 in. thick.

17.7 (nearly 18) amperes per sq. foot give a deposit 1/1000 in. thick, while in 10 hours:

177 amperes per sq. foot give a deposit 1/10 in. thick, and 17.7 amperes per sq. foot give a deposit 1/100 in. thick.

A PLATING ROOM LAYOUT

A Diagram Showing the Proper Method for Using the Three Wire System.

The accompanying sketch gives the correct way to connect up a plating room outfit. The three-wire system is used and the generator of the size required of high and low voltage.

Referring to the drawing, it will be seen that tanks Nos. 1, 2, 3, 4, 5, 6, 7 and 8 are nickel tanks and are connected between the positive line from the generator and the neutral line, and of course these tanks get their low voltage from the end of the generator towards the top of the cut. Tanks 9, 10, 11, 12 and 13 are nickel tanks. Tanks 14 and 15 are acid zinc tanks. Tank 16 is cyanide of zinc tank. The tanks 9 to 16 inclusive get their low voltage from a connection made between the negative and the neutral line and they receive the current from the ends of the generator, pointing toward the bottom of the drawing. Tanks 17 and 18 are revolving zinc plating machines and should have the 12-volt connection. It will be noticed that they are connected between the positive and the negative outside line of the circuit. The same is true of the electric cleaner, Nos. 20 and 21. Both of these tanks should receive the current from the high voltage line and they are connected between the two outside lines positive and negative, the same as the plating barrel. Tank No. 19 is a cyanide of copper tank and has a low voltage current, receiving the current between the negative and neutral line.

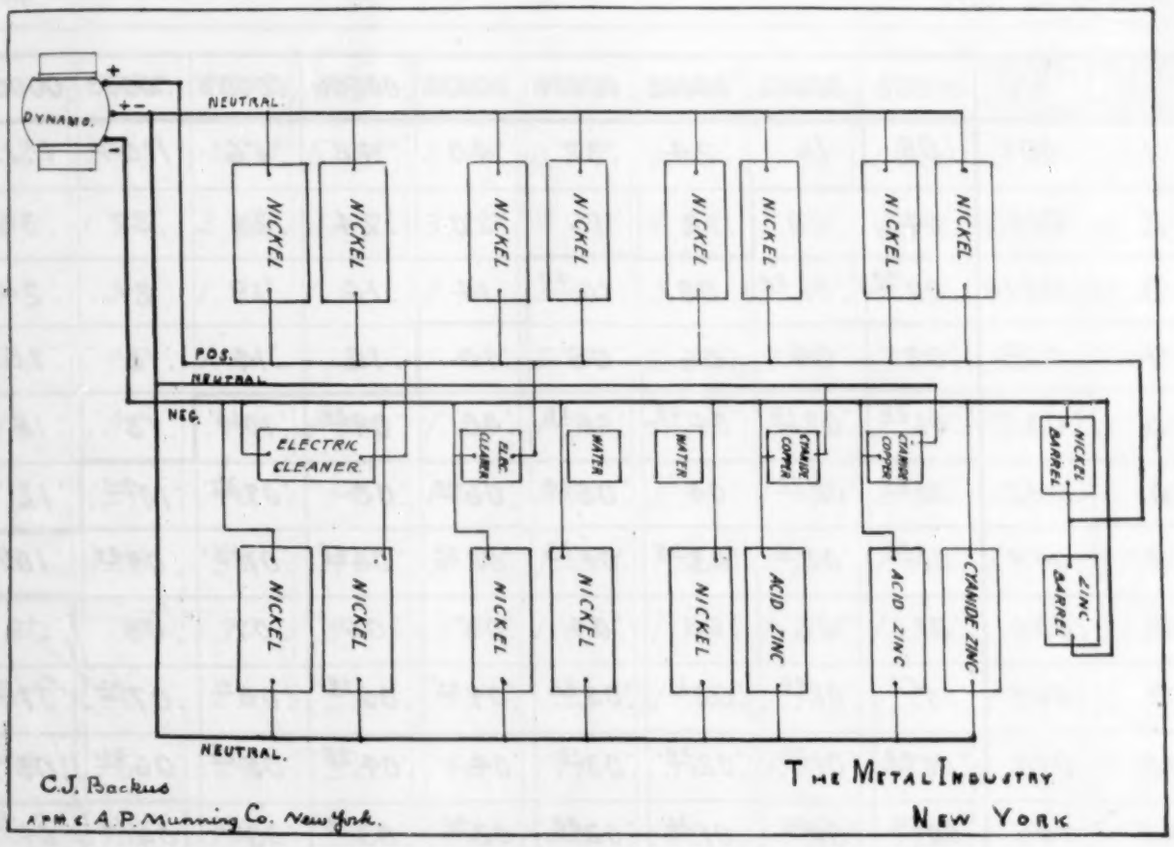


DIAGRAM OF WIRING FOR A PLATING SHOP ON THE THREE WIRE SYSTEM.

PROPER ALLOY FOR CASTINGS TO BE BRAZED.

A satisfactory mixture for castings that are to be brazed with hard solder is copper 80 and zinc 20. This alloy is known in many brass foundries as "brazen" metal. The hard solder in most general use is composed of copper 50 and zinc 50, so that the difference in melting point between the two alloys is sufficient to enable satisfactory brazing results to be obtained. In fact hard soldering can be done on alloys much below the 80 copper and 20 zinc alloy, in melting point. The increase in melting point due to the addition of 2 per cent nickel is not very great, and it is more than counterbalanced by the fact that all alloys containing nickel are hard to braze because of the coating of nickel oxide on them. The nickel also makes the metal sluggish when molten, so that it has to be overheated for pouring, thus rendering shrinkage cracks likely and increasing the difficulty of obtaining solid castings.

Hydraulic metal (copper 100, tin 10, sheet or tube yellow brass 25) cast into ingots and remelted, gives very good results in castings that must stand hydraulic pressure. A skilled mechanic would have no difficulty in brazing copper tubes into tube heads made from this mixture, using ordinary brazing solder. Silver solder seems to be the most satisfactory alloy for brazing nickel alloys. Silver solder, however, is very expensive, and if the nickel is omitted from the mixture it ought not to be necessary.

J. L. J.

METAL PLATING—II

A Compilation of Tables Showing the Time Required to Deposit a Given Thickness of Zinc.

(Written for The Metal Industry by W. G. Knox, Associated with the Chemical Laboratory of the Western Electric Company, Inc.)

In presenting this series of tables on electro-deposition of the principal metals to readers of The Metal Industry, it is with the expectation that they will reach the greatest number of people interested in the plating field.

CURRENT DENSITY — TIME REQUIRED FOR A THICKNESS IN INCHES OF ZINC — HOURS,

AMPERES PER SQ-FOOT	AMPERES PER SQ-INCH	.00001	.00002	.00003	.00004	.00005	.00006	.00007	.00008	.00009
1	.007	:08	:16	:24	:32	:40	:48	:56	1:04	1:12
2	.014	:04	:08	:12	:16	:20	:24	:28	:32	:36
3	.021	:02 40	:05 20	:08	:10 40	:14	:16	:19	:21	:24
4	.028	:02	:04	:06	:08	:10	:12	:14	:16	:18
5	.035	:01 36	:03 12	:04 48	:06 24	:08	:09 36	:10 12	:13	:15
6	.042	:01 20	:02 40	:04	:05 20	:06 40	:08	:09 20	:10 40	:12
7	.049	:01 08	:02 16	:03 24	:04 32	:05 40	:06 48	:07 56	:09 04	:10 12
8	.056	:01	:02	:03	:04	:05	:06	:07	:08	:09
9	.063	:00 53	:01 46	:02 39	:03 32	:04 25	:05 18	:06 11	:07 04	:07 57
10	.070	:00 48	:01 36	:02 24	:03 12	:04	:04 48	:05 36	:06 24	:07 12
15	.105	:00 32	:01 04	:01 36	:02 08	:02 40	:03 12	:03 44	:04 16	:04 48
20	.140	:00 24	:00 48	:01 12	:01 36	:02	:02 24	:02 48	:03 12	:03 36
25	.175	:00 19	:00 38	:00 57	:01 16	:01 35	:01 54	:02 13	:02 32	:02 51
30	.210	:00 16	:00 32	:00 48	:01 04	:01 20	:01 36	:01 52	:02 08	:02 24
35	.245	:00 14	:00 28	:00 42	:00 56	:01 10	:01 24	:01 38	:01 52	:02 06
40	.280	:00 12	:00 24	:00 36	:00 48	:01	:01 12	:01 24	:01 36	:01 48
45	.315	:00 11	:00 22	:00 33	:00 44	:00 55	:01 06	:01 17	:01 28	:01 39
50	.350	:00 10	:00 20	:00 30	:00 40	:00 50	:01	:01 10	:01 20	:01 30
GRAMS PER SQUARE INCH		.00113	.00226	.0034	.0045	.0057	.0068	.0079	.0091	.0102

Atomic weight of zinc, 65.37.
Specific gravity of zinc, 6.90.
Electro-chemical equivalent of zinc, .000336.
Grams deposited per ampere hour, = 1.22.

The first article (June issue) presented a table on the electro-deposition of cobalt or nickel, and this table gives a similar table on zinc. It was intended to publish the table on zinc first, but as the approved calculations were not ready in time, the table for nickel or cobalt was substituted. This substitution may have caused slight confusion in the minds of some readers. The approved table for electro-deposition of zinc is shown in this issue.

As explained in the first article, the calculations of time are based on the amount of metal theoretically deposited when the efficiency is 100 per cent and represent the average deposit per unit area. Sometimes the efficiencies are lower than this figure and in other instances higher, but for purposes of calculation it appears reasonably safe to assume 90 per cent. It will, therefore, be necessary to add 10 per cent in each case to the figures of time.

CALCULATED ON THE BASIS OF 100 PER CENT. CATHODE EFFICIENCY
MINUTES AND SECONDS.

.0001	.0002	0003	.0004	.0005	.0006	.0007	.0008	.0009	.001	.002
1:20	2:40	4:00	5:20	6:40	8:00	9.20	10:40	12.00	13:20	26:40
:40	1:20	2:00	2:40	3:20	4:00	4:40	5:20	6:00	6:40	13:20
:27	:54	1:20	1:47	2:14	2:40	3:07	3:34	4:00	4:27	8.54
:20	:40	1:00	1:20	1:40	2:00	2.20	2:40	3:00	3:20	6:40
:16	:32	:48	1:04	1:20	1:36	1:52	2:08	2:24	2:40	5:20
:14	:27	:40	:54	1:07	1:20	1:34	1:47	2:00	2:14	4:28
:12	:23	:34	:46	:57	1:08	1:20	1:31	1:42	1:54	3:48
:10	:20	:30	:40	:50	1:00	1:10	1.20	1:30	1:40	3:20
:08 40	:18	:27	:36	:45	:53	1:02	1:11	1:20	1:29	2:58
:08	:16	:24	:32	:40	:48	:56	1:04	1:12	1:20	2:40
:05 20	:10 40	:16	:22	:27	:32	:38	:43	:48	:54	1:48
:04	:08	:12	:16	:20	:24	:28	:32	:36	:40	1:20
:03 10	:06 20	:09 30	:13	:16	:19	:23	:26	:29	:32	1:04
:02 40	:05 20	:08	:10 40	:14	:16	:19	:22	:24	:28	:56
:02 30	:04 40	:07	:09 20	:12	:14	:17	:19	:21	:24	:48
:02	:04	:06	:08	:10	:12	:14	:16	:18	:20	:40
:01 50	:03 40	:05 30	:07 20	:09 10	:11	:13	:15	:17	:19	:38
:01 40	:03 20	:05	:06 40	:08 20	:10	:12	:14	:15	:17	:34
.01130	.0226	.0340	.0452	.0565	.0678	.0791	.0904	.1017	.1130	.226

NOTE—Time below 11 minutes given in minutes and seconds; 11 minutes and above given in hours and minutes. The heavy diagonal line divides the two sections.

Zinc always has the same valence (two). It is deposited principally from the sulphate and cyanide solutions; the former is the older and more commonly used electrolyte, but the cyanide solution has gained in popularity during the past two or three years. There is, without doubt, good cause for this change in feeling, since an alkaline bath for iron and steel work is quite desirable. As above noted, the valence of zinc is always two—hence the rate of deposition is the same, regardless of the type of electrolyte used. The table therefore holds for all solutions of zinc. For the benefit of those who may not have read the original article or for those who perhaps may not have thoroughly understood the arrangement of the table, a few explanations are given here.

The current density is shown as amperes per square foot and as amperes per square inch. The thickness of deposit covers a wide range, with a minimum of .00001 inch to a maximum of .002 inch. At the bottom of the table for each thickness is shown the corresponding weight of metal per square inch. If it is desired to convert these weights to grams per square foot, multiply each

HOW TO USE THE TABLE.

by one hundred and forty-four (144).

The following examples illustrate the correct method of reading the figures for time: $.00^{32}$ is read thirty-two seconds, $.05^{20}$ is five minutes and twenty seconds, :57 is fifty-seven minutes, and 3:20 is three hours and twenty minutes.

Zinc is unquestionably the best metal protective against for iron and steel, especially when these latter metals are exposed to atmospheric influences, for the reason that zinc is electro-positive to iron. The question then arises: What weight of deposit is necessary for good protection? It is probably safe to say that a deposit approximating fifty (50) to sixty (60) milligrams per square inch of plated surface will give fairly good protection. A coating of this weight is nearly .0005 inch in thickness, and is about a quarter of an ounce per square foot. Referring to the table under the thickness of .0005 inch, the time required to deposit this amount of metal will be found for the various current densities. Ten to twenty-five amperes per square foot is probably the average C. D. in use today for electroplating with zinc. The plating time therefore will be forty to sixteen minutes (plus ten per cent.). Platers should know the approximate area of work to be plated and the thickness of deposit desired. It is then a simple matter to refer to the table for the time necessary to do the job.

[It is the intention of THE METAL INDUSTRY to publish these tables in pamphlet form at the completion of the series. This is the second. The first was on copper and nickel and there are to be several more.—Ed.]

ZINC LOSS IN ZINCING.

SOME INFORMATION OF VALUE TO THE USERS OF ZINC FOR COATING IRON AND STEEL.

We recently received from one of our subscribers the following inquiry:

Will you kindly inform me if there is a possibility of a loss by oxidation in a zincing kettle of 1,000 pounds of spelter per day? Coating on ware shows light weight, ash and skimmings normal, yet the loss shows several thousand pounds short and I am unable to trace same. I am well aware of a certain percentage of loss by oxidation yet have never had anything like this happen before. As I am running much overtime, dross per kettle shows about 2,100 pounds per week. This is a little above the average, yet considering the amount of ware done and time operated it does not appear very excessive. We are using a Brown instrument for gauging temperature, natural gas fires and much scrap zinc in kettles. The scrap used is both heavy sheet and old forms such as jar caps, etc. Prime Western spelter is also used. The amount of zinc melted each day is 5,500 to 6,000 pounds, 11 hours operation, three kettles. Tubs, pails, cans, covers and some castings, both large and small, are zinced.

The following information is given by our expert in answer to the above inquiry:

If all your weighings are carefully and accurately made there should be no question as to where the zinc goes that you add to your kettles. There are only four places that it can go, viz.:

1. The ash and skimmings.
2. The dross.
3. The splatters, drippings and shakings.
4. The coating on the work zinced.

There could not be an excessive loss of zinc by oxidation without the amount of ash and skimmings showing a proportional increase. Where much light scrap is used, an unusual amount of ash should be found and one would expect it to contain numerous small pieces of partly oxidized sheet and much fine shot metal. By puddling the scrap into the bath and pushing it under the molten zinc, these losses should be reduced.

A majority of hot zincing plants are producing at the present time more than the usual amount of dross, because the Norway iron that should be used for the sides of all kettles, has not been available. The kettle makers have had to use ordinary open hearth steel, much of it 0.25 per cent. in carbon or higher. This has resulted in excessive drossing and a very short life of the kettles. The splatters, drippings and shakings from the water tanks on some classes of work are considerable and should be taken into account when figuring where the metal goes.

Even when a pyrometer is used the coating on zinced work may vary considerably and be much heavier at some times than others. When the pyrometer is taken out of a kettle is seldom indicates room temperature and may read much higher than it should read, in other words, the kettle may be running cooler than the zincers thinks it is and the coating as a consequence be heavier than anticipated.

Some very promising work is being done on adapting electric heating to hot zincing kettles and in developing a regulating thermostat that will cut off the current if the zinc is heated above the proper temperature and cut it in again as soon as it drops below the temperature that gives the best results. The regulating thermostat works equally well on gas and is an efficient means of keeping dross at a minimum.

You are certainly not justified in thinking that there is any mysterious or unexplainable reason for your excessive zinc loss. A careful survey of your process along the lines indicated above, should disclose whether any real trouble exists and if so, its cause and remedy.—J. L. J.

SALARY AND WAGE ADJUSTMENT

A Description of a Method that Has Been Found Satisfactory at a Large Plant.

Written for The Metal Industry by Mett McKune.

The present method of buying or selling labor is for each participant in the transaction to drive as sharp a bargain as possible, whether it be when the contract is first made or at any later time when the employee feels that a new wage rate should be arranged.

This may be business, but it tends to create an unfriendly feeling at the outset between employer and employee, the one who has had the best end of the transaction is presumably satisfied, but the one who has not feels that the other has taken advantage of the conditions, and that he has been imposed upon.

The plan outlined in this article is not original except perhaps for some of its details possibly it may never have been put on paper before, but this is one of its strong points that it does not present a plan new and untried but it does take the present plan and with some few changes adapt it to the need of the present time and conditions.

The plan provides for the classification of all help, the adoption of a minimum rate to be paid at the beginning of the service, for a periodic increase, the minimum to be attained at the end of the period when it is assumed that the employee has attained to his or her highest degree of efficiency. As planned in this article, the period is five years, the agreement is made and the employe begins his term of service at a rate which it is assumed is fair for him as well as his employer. It provides for an advance for the second, third and fourth years, this increase to be uniform for these years, but at the beginning of the fifth year, when he has attained to his highest degree of efficiency, his yearly increase is just double what it was for the preceding years.

It must be understood by the employee, as it is by the employer, and I think there is no question but that this is thoroughly understood, that there is a limit to the amount that anyone can pay for any one class of labor. that its value is fixed as is the price of any commodity.

The advantages to the employee are briefly as follows: He has engaged his services for a year at a fair rate; he is assured of a uniform increase for three years and with an increase for the fifth year double the amount of the increases for the preceding years; he is not dependent upon the good will of his foreman, neither is he obliged to wait for a favorable opportunity to present his arguments for an increase or, having made his plea for a higher wage rate, to have to wait until his request has been passed up from one to another until it reaches one who has the authority to grant or reject his request, but his wages are advanced automatically each year until he receives the maximum amount paid his class.

The plan also provides for the promotion from any one class to one higher, but this will be explained after the plan of classification has been outlined.

For the employer some of the advantages are that he is saved the continual worry caused by requests for more money; that the plan of increasing the wages uniformly for three years with the certainty of a greater increase the fifth year tends to make the employee satisfied, and consequently less apt to leave; his efficiency is increasing and the expense of educating new help is greatly reduced.

As to the expense, let us assume that in a particular class the minimum rate is $3.00 per day with an advance for three years of 25 cents per day and for the fifth year of 50 cents, the daily rates would be as follows: $3.00, $3.25, $3.50, $3.75 and $4.25. The average would be $3.55, or had the employe been engaged at the beginning at a daily wage rate of $3.50 and at the beginning of the third year been advanced to $3.75, the average would have been $3.80 for the five years.

While the employee may feel that the minimum wage rate is a little low, he understands that the maximum amount paid is considerably more than he would ordinarily receive, the saving to the employer being only in the increased efficiency of the employee, his loyalty and the expense of educating new help.

The classification of help presents no great difficulty, nor does the fixing of the minimum and maximum wage with the yearly increase; in fact this is done perhaps unconsciously every time a new employee is engaged, and after the help has been classified and the plan is in operation it only requires the classification of each new employee.

It is to be understood that the classification, rates and advances given are only to illustrate the plan and are not intended to be a correct statement of rate of salary or wages paid for any one class of labor.

The first classification is for office or salaried employes, the salaries for six classes provided for are as follows:

	Class 1	Class 2	Class 3
1st year	$10.00	$12.00	$15.00
2nd year	11.00	13.00	16.00
3rd year	12.00	14.00	17.00
4th year	13.00	15.00	18.00
5th year	15.00	17.00	20.00
	Class 4	Class 5	Class 6
1st year	$18.00	$20.00	$25.00
2nd year	19.00	21.00	27.00
3rd year	20.00	22.00	29.00
4th year	21.00	23.00	31.00
5th year	23.00	25.00	33.00

Class 1. Clerks untrained.
Class 2. Trained help—stenographers, etc.
Class 3. Billing clerks, etc.
Class 4. Bookkeepers, etc.
Class 5. Assistant heads of departments.
Class 6. Heads of departments.

To illustrate the working of the plan we will assume that a young lady who has had no special training is engaged as a clerk. She is placed in Class 1, but at the expiration of her fifth year of service or at some time later she qualifies for a higher class. Her knowledge of the work is such that she can no longer be considered as untrained, but has become an expert in her particular line or has qualified for some line of work which requires special training. She is then advanced to Class 2. If in her new class the work was something in which she might require some experience before she could properly perform the new duties, she would be classified as a Class 2, fourth year. Her salary for the remainder of the year remaining $15.00, but at the end of the year receiving the increase to which she is entitled as a Class 2, fifth year, employee. If she required no breaking in to the new line of work she would become at once a Class 2, fifth year, employee with its salary. But it is not necessary for an employee to wait until the expiration of the fifth year to be promoted. Had the young lady shown while she was but a Class 1, third year, employee special qualifications for a higher class she could have been promoted and would have become a Class 2, second year. She has received two promotions, one of an increase of salary and the other to a higher class with a higher maximum salary. A Class 5, fifth year, man

who is an assistant head of a department is promoted to have charge of his department. He then becomes a Class 6, second year, man with not only an increase in his salary at the time of his advancement, but he has three more yearly advances to anticipate with a yearly rate when he becomes a fifth year man considerably higher than he would have received in the lower class. When a promotion is made the salary he receives determines his yearly rating in the new class. A fifth year class five year man at a salary of $25.00 becomes a Class 6, second year, man at $27.00.

The plan as used in the factory provides rates per day as follows:

RATE TABLE.

	Class 1	Class 2	Class 3	Class 4
1st year	$1.00	$1.25	$1.50	$1.75
2nd year	1.25	1.50	1.75	2.00
3rd year	1.50	1.75	2.00	2.25
4th year	1.75	2.00	2.25	2.50
5th year	2.25	2.50	2.75	3.00

	Class 5	Class 6	Class 7	Class 8
1st year	$2.00	$2.25	$2.50	$2.75
2nd year	2.25	2.50	2.75	3.00
3rd year	2.50	2.75	3.00	3.25
4th year	2.75	3.00	3.25	3.50
5th year	3.25	3.50	3.75	4.00

	Class 9	Class 10	Class 11	Class 12	Class 13
1st year	$3.00	$3.25	$3.50	$3.75	$4.00
2nd year	3.25	3.50	3.75	4.00	4.25
3rd year	3.50	3.75	4.00	4.25	4.50
4th year	3.75	4.00	4.25	4.50	4.75
5th year	4.25	4.50	4.75	5.00	5.25

Classes 1-2. Boys and girls.
Classes 3-4. Laborer, truckmen, etc.
Classes 5-6. Semi-skilled help.
Classes 7-8-9-10-11-12-13. Skilled help.

Promotions to higher classes are the same as planned for the salaried employees. We will assume that a class 6, fifth year, man is entitled to promotion and become a Class 7, fifth year, man. Had he received his promotion he would have become a Class 7, third year, man. If an employee fails to make good in the class to which he is assigned he is demoted. A Class 5, first year, man is found unable to qualify for that particular line of work, but he can be used as a truckman. He is assigned to Class 4 and given the rating of a second year man, his wages are not reduced and he receives the yearly increase, but the maximum wage is lower than in the other class. This plan is not without its defects, but it does offer a solution of what is a very vexatious problem, and if it impels others better qualified to give this question consideration and evolve a better solution of the problem it will have served its purpose.

GERMAN METAL MELTING PRACTICE

GAS-FIRED SMELTING FURNACES WHICH ENABLE CRUCIBLES TO BE DISPENSED WITH.

As the war has rendered the importation of graphite crucibles into the Central Empires practically impossible, and as on the one hand the raw materials required for their manufacture can only be obtained in Germany and Austria-Hungary in very limited quantities, whilst on the other hand even the material obtainable is not very satisfactory for the purpose in question, many metal founders have tried to overcome the difficulty by the use of smelting furnaces capable of working a charge up to 1,000 kilograms, and which enable crucibles to be entirely dispensed with, although it must be admitted that the waste in the case of the more volatile metals is very great. In furnaces of this kind it is, however, necessary to dispense with the hitherto usual method of heating by means of crude or tar oils on account of the present scarcity of liquid fuels, and to substitute for it a system of gas-firing in which the gas is mixed with compressed air under a pressure of from 400 to 1,500 mm. heads of water to intensify the combustion, and enable it to be conducted within a comparatively small chamber. In cases in which it is necessary to work at temperatures of upwards of 1,200 deg. C., the compressed air requires preliminary heating. According to the method of construction preferred, the furnaces may be arranged either as flue or as circulatory furnaces. In furnaces of the former kind, both the burner and the outlet for the combustion gases are so arranged that these gases are caused to pass through the flue in an axial direction. In such cases the arrangement is such that the gases before escaping from the furnace are forced to return to the side at which they enter the furnaces; consequently it is possible to distinguish between furnaces in which the gases merely pass through the flue and those in which they make a return journey. In the case of circulatory furnaces, the heating gases are caused to flow through the furnace in a tangential direction, the most common arrangement being that in which the gases arising from two burners pass into the furnace and flow through it with a circular movement. The burners most suitable for either type of furnace must not be very long, and should permit of a thorough admixture of the gas and air. They should be so constructed that they can easily be arranged to take the place of the oil-burners heretofore usual, whilst the fact should be borne in mind that the furnaces are so constructed that they can be tilted over in order to facilitate the discharge of the molten metal, an arrangement which in some cases may involve some difficulties in the satisfactory fitting up of the necessary gas-connection. The waste gases of such furnaces may be utilized to effect the preliminary heating of the receptacles into which the molten metal is poured, whilst part of their heat may during its passage through the air-heater, usually consisting of gas pipes, be transferred to the compressed air supplied by a fan or the like. A furnace of this kind, having a charge of 760 kilograms of an alloy, the fusing point of which lies between 1,300 and 1,360 deg. C., consumed 36 cubic meters of gas to each 100 kilograms of the alloy, the duration of preliminary heating being 15 minutes. The time taken up by the insertion of the charge was 20 minutes, and the melting down of the metal took two and a half hours. The temperature of the combustion gases in the furnace varied from 1,380 to 1,440 deg. C., these gases entering the air-heater at 1,250 deg. C., and passing out of it at between 330 and 350 deg. C. The compressed air underwent preliminary heating up to 295 deg. C. Although the plant has been in daily use since June, 1916, no repairs, except the partial renewing of the furnace lining, have been found necessary.

In the case of the furnace referred to, constructed by the Dusseldorf firm of Poetter for an Austrian metal foundry, the cost of fuel for each 100 kilograms of the charge amounted to 5.20 K., whilst the cost of smelting an equal amount of metal, when crude oil is employed, works out at 5.70 K., and when tar oil is employed it is as high as 7.63 K. Attention must, however, be directed to the fact that these calculations are based on the present very high prices of oil. It is undoubtedly true that in the case of the continuous working of such furnaces the cost of gas-firing could be reduced.—"Dingler's Polytechnisches Journal," No. 13.

EDITORIAL

Vol. 17 New York, August, 1919 No. 8

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER AND BRASS, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS' REVIEW
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STANDARDIZATION

That the time has come for the adoption of standard chemicals, supplies and methods for electro-plating is very evident from the interest shown in the subject by the American Electro-Platers' Society at its recent convention in Philadelphia, Pa. Although what promised to be a serious discussion regarding working methods developed into a rather severe arraignment of chemical manufacturers and purchasing agents; enough evidence was revealed to indicate the determination of the platers as a body to arrive at some definite conclusion. We are sure that the Committee appointed to carry on research in conjunction with the Bureau of Standards will give the matter of purity of chemicals sold in the open market, earnest and serious consideration. In this connection we believe that every electro-plater can do great work in his own plant. All that is necessary, and we speak from experience, is for the plater to get together with his purchasing agent and draw up specifications to cover the chemicals and supplies requisite for the particular work in hand. While the Committee on research is deliberating and formulating general standards, the electro-platers of the country can work out their standards and when they have decided on what they find is best in their own plant, they can send this information to the Committee. In this way the whole subject will be attacked at once by many minds from possibly at as many different angles and the Committee can then intelligently draw proper specifications.

From the statements made at Philadelphia it would seem that the average purchasing agent was a natural born enemy of the plater or metal finisher. One who took a peculiar delight in ignoring requests for certain materials and perversely insisting on purchasing chemicals chosen by himself. From personal experience we can say we do not believe any such thing. Due to a number of years association with many purchasing agents, we are able to testify that we have always found the purchasing agent ready to learn and anxious to aid in the production of manufactured articles in as efficient and economical a manner as possible.

All we have had to do was to explain what was wanted and why, and we never found a man who did not willingly respond. So in a certain sense the plater can be his own purchasing agent.

Considerable criticism was also heard at the Convention regarding misrepresentation by manufacturers of the chemicals offered for sale. This is a matter which is also in the hands of the plater. By virtue of his being a member of the American Electro-Platers' Society he proves his desire to become more skilled and proficient in his art. He is offered the opportunity to study methods, taught by competent experts, which will enable him to analyze and test every thing he has to use. There is no way, we believe, that will drive the dishonest chemical from the market sooner than the knowledge that the materials offered for sale will be subjected to critical and competent analysis. So another part of the duties of the research committee

will be to formulate and publish standard methods of analysis and testing.

The third aim of the Committee and the Bureau of Standards will be the formulation and adoption of standard methods for the preparation of solutions and their operation. This is one of the main objects of the Society and it is to be congratulated upon the progress made, in that after ten years of existence it has at last made a definite move which bids fair to bring forth important and lasting results.

AID REQUIRED

As told by Dr. Blum to the platers, all the work mapped out requires something besides technical and practical co-operation, financial assistance is also needed. The appropriation allotted by Congress to the Bureau of Standards for the coming years is not sufficient to allow the Bureau to carry on its work relating to Electro-Plating at even the scale that it was done in the past. In order to make it possible therefore that there shall be no lapse, it is suggested that the aid of those most vitally interested in the art shall be invited. It is estimated that about $20,000 per year for the next three years will be required to provide for the program scheduled.

To this end a circular is being prepared which in due time will be distributed and we have no doubt but that the invitation to contribute to this most important work will be cordially accepted by manufacturers and others interested who will not "Cast their bread upon the waters in vain."

CORRESPONDENCE AND DISCUSSION

While we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein.

ETCHING SOLUTIONS

To the Editor of THE METAL INDUSTRY:

Having read the article by E. G. Jarvis, entitled "Etching Solutions and their Uses," published in the April issue of THE METAL INDUSTRY, I should like to add a few notes of my own experience of the etching solutions mentioned, and also to add some slight criticisms of the uses to which Mr. Jarvis has put them.

AMMONIUM PERSULPHATE.—A 10 per cent. solution alone from my experience is not to be recommended as an all-round reagent for eaching copper alloys; particularly the alpha-beta copper-zinc alloys and the phosphor bronzes, and should only be used in special cases. It is particularly useful for deep etching for developing the crystal grain. For alloys of the copper-zinc series, those rich in copper, the best reagents for etching is a dilute solution of ammonia (1:5), to which has been added a few drops of a 10 per cent. ammonium persulphate solution. The right amount of persulphate to add can soon be found by experience, and I have obtained excellent results with this reagent in this way.

HYDROGEN PEROXIDE.—This reagent is only used in very special occasions. It is useful in a few drops added to dilute ammonia solution (1:5) for etching most copper alloys, but the ammonium persulphate solution above is more often used. The best method for developing oxygen inclusions in copper is to examine unetched, when the copper-oxygen eutectic is readily detected against the salmon-pink copper background.

AMMONIA.—For etching most copper alloys, a dilute solution of ammonia in water (1:5) is probably one of the best. The reagent is applied to the specimen by rubbing with the little finger, and after a little experience very good effects are readily obtained. One of the most difficult micro-sections to etch is that of pure rolled copper, and a considerable amount of patience is required. The method the writer uses is to rub gently on parchment wetted with dilute ammonia to which has been added a few drops of a 10 per cent. solution of ammonium persulphate solution. It is the addition of the persulphate solution where experience is very useful and a considerable amount of time saved.

NITRIC ACID.—I think Mr. Jarvis has made a slight mistake here as it is a 1 per cent. solution of nitric acid in alcohol which is generally used, although as the author points out some people prefer a saturated solution of picric acid for ferrous alloys; nitric acid is apt to pit the ferrite rather badly. This reagent is very useful for etching white metal alloys and acts more quickly than hydrochloric acid, and gives a better contrast for photography.

FERRIC CHLORIDE.—I am surprised the author does not obtain success with this reagent for copper alloys, as I have found exactly opposite and should recommend ferric chloride as an ideal reagent for such alloys as occur in the copper-tin series, and particularly phosphor bronzes. This reagent is also very useful for copper-zinc alloys, such as manganese bronzes.

IODINE ETCHING I have not had occasion to use, as the commoner reagents already mentioned have been found ample. For etching aluminum and its alloys, 4—5 per cent. hydrofluoric acid is very useful. The reagent more generally used, however, particularly for developing the crystal grain, is 10 per cent. aqueous caustic soda. This reagent with a number of aluminum alloys forms a black deposit on the surface, which may be removed by immersing in chromic acid.

CHROMIC ACID I have found very useful as a special reagent, and may be used alone or mixed with other acids. One particular instance I remember occurred when I had a lead-tin eutectic alloy to etch, and as all other reagents failed to give satisfaction, I tried chromic acid in water as the last resort and obtained an excellent result. One cannot lay down a hard and fast rule that this or that reagent is more suitable for any particular alloy, and, as a rule, several reagents have to be tried before the desired result is obtained. Different reagents have different effects on the same alloy, and some experience is necessary to differentiate between the various structures. I should like in conclusion to thank E. G. Jarvis for his notes on etching solutions, as I am sure they will be very useful to metallographers generally.

ERNEST J. DAVIS.

Beeston, Notts, London, England.

HIGH STEARIC ACID COSTS AND THEIR EFFECT ON THE POLISHING TRADE

To the Editor of THE METAL INDUSTRY:

Every user of buffing and polishing compositions is of necessity vitally interested in the cost of stearic acid, because this material is used in the manufacture of all good buffing and polishing compositions.

The cost of stearic acid has soared in the last few weeks to heights unreached during the war period, and a brief survey of the underlying conditions of the stearic acid market will be of interest to the user.

In the early fall of last year tallow, from which stearic acid is produced, was selling at approximately 20 to 21 cents per pound, depending upon quantity. At the same time glycerine, a by-product of tallow, which is produced in the manufacture of stearic acid, was bringing from 55 to 60 cents per pound.

With the signing of the armistice, and the natural reaction from the tremendous war activities, commodity prices in general receded, and particularly so, the prices of fat stock, such as tallow. At the same time due to the total cessation in the demand for glycerine the price of this article dropped suddenly from 55 to 60 cents per pound to about 15 cents per pound.

Inedible tallow suitable for the manufacture of stearic acid sold as low as 8½ cents per pound at that time.

In a few weeks, however, an export demand for fat stocks of all types arose, particularly tallow for soap making.

As time passed this demand instead of being satisfied, steadily increased. Up to the present writing there are no apparent signs of a let-up and the natural consequence has been a continuous price advance.

In gauging the resulting effect of this advance on the value of stearic acid, it should be calculated that the usual product of a given 100 pounds of tallow consists of approximately 8 pounds of

glycerine, 35 pounds of stearic acid and the remainder oleic acid, commonly called "Animal Red Oil."

A very peculiar condition thus presents itself: The raw material, tallow, is continually advancing and sold last week at 21 cents per pound, while glycerine has advanced to only 20 cents per pound from the recent low level of 15 cents per pound. At the same time the 58 lbs. of oleic acid in each 100 pounds of tallow has followed in a lagging manner, selling only at a price which is several cents per pound below the cost of the tallow itself.

The consequences are that the burden of manufacturing costs has been laid more heavily on stearic acid than during the war period, due absolutely to the abnormal conditions just referred to. For this reason stearic acid to be produced from tallow at the present market price of the latter product must bring from 30 to 32 cents per pound in order to show even the smallest manufacturing profit. Were we to have in the near future a tremendous ratio of increase in the price of oleic acid, so that this acid would sell at a considerable premium over the cost price of the raw material, and if at the same time glycerine should have a corresponding advance to 30 cents per pound, and the raw material, namely, tallow, stay at the present level of price, the resulting effect would be a marked decrease in the cost of stearic acid. This condition, however, is not likely to happen during the next two or three months, because the recent demand for oleic acid has been very heavy and apparently is now satisfied. The probabilities therefore, are that the high tide of oleic acid costs has been reached, and that there may be a still greater difference between its cost and the cost of tallow in the near future.

As explained, the result of this would be to add to the burden which stearic acid would have to carry.

It can be seen from the above that the conditions surrounding the production of stearic acid are most unusual. Whenever the demand and consequently the selling prices of glycerine or oleic acid decreases, the price of stearic acid goes up.

A close observation and study of general market conditions regarding this product convinces one that the only hope for early relief is in the slackening up of Europe's demand for fat, or a marked increase in the quantity of fat produced.

New York, July 28, 1919. "STEARIO."

METALLURGICAL FURNACES

To the Editor of THE METAL INDUSTRY:

Referring to the article on "Metallurgical Furnaces," by A. Bregman, which appears in the current issue of your journal, will you kindly permit me to point out one of the errors it contains?

On page 161 of the April issue, the writer recommends the use of chrome and magnesite bricks for copper refining. He describes them as excellent for the purpose. I would like to ask Mr. Bergman upon what experience he bases this recommendation, since it is so contrary to the usually accepted idea and experience. A few years ago one of the largest copper refineries in the United States decided to utilize chrome bricks in place of silicious linings in its refining furnaces, but their use has proved economically disastrous. The absorption of molten copper was surprisingly heavy, and the cobbing extremely difficult of treatment in the blast furnace used for the recovery of the absorbed copper. Trouble was experienced in the settlers, and the amount of copper lost in the slag through improper settling was very serious. An important paper on the "Disadvantages of Chrome Brick for Copper Refining Furnaces" was read last year before the American Institute of Mining Engineers, and I would respectfully refer Mr. Bregman to this paper.

Magnesite, too, is not without its disadvantages, since it shows a tendency to crack and spall badly when subjected to the alternate heating and cooling that takes place in a copper refining furnace. In the writer's opinion, the British practice of lining gives, perhaps, after all, the best results.

London, England. July 8, 1919. F. YATES JONES.

To the Editor of THE METAL INDUSTRY:

Please convey my thanks to F. Yates Jones for pointing out the ambiguity in my article on metallurgical furnaces. I had, of course, seen the paper on "Disadvantages of Chrome Brick for Copper Refining Furnaces" in the proceedings of the A. I. M. E., but when I mentioned chrome brick as excellent for lining furnaces I had in mind the practice of placing one or two courses of neutral chrome brick between the magnesite and the silica brick. However, as my statement read it was misleading.

There are, of course, objections to magnesite brick also, on the grounds of spalling, as he states, but the general practice still seems to be to use it to line the walls from the silica sand bottom to a little above the highest level of the metal bath. According to Francis R. Pyne, assistant superintendent United States Metals Refining Company in the previously mentioned paper, "experiments seem to indicate that the tendency of magnesite brick to crack and spall can be overcome by subjecting the brick to pressure before burning, which should also cause less metal absorption." ADOLPH BREGMAN.

New York, July 28, 1919.

PRACTICAL VALUE OF THE TRADE JOURNAL

NEW YORK, N. Y., June 10, 1919.

To the Editor of THE METAL INDUSTRY:

We think that you will be interested in knowing the value we place upon the trade press for information. We know from experience in the past that a man running a newspaper or a trade publication does not usually hear of the nice things and the good work that it does, only the kicks and the knocks.

Therefore, it ought to be refreshing to hear of some of the good offices that such an enterprise fills, and to show you how important the trade publications are regarded by The New Jersey Zinc Company, we quote below the words that appear on the front cover of our Library Bulletin, which is issued by our Library each week.

"The technical or trade journal of today is the livest and most 'up-to-now' assistant a business man has. It is carefully edited, well printed, fully illustrated and thoroughly indexed, both as to literary matter and advertisements. It is the 'always ready reference' of the minute and the official, head of a department, or even workman who does not use it to its fullest capacity is neglecting one of his best friends.

"In no other way can any business man, no matter how high or low his position, keep so fully abreast of the time in his business as by early and careful perusal of his trade and technical periodical, from its front to its back cover, and from no other source can he obtain the 'immediately useful' so well as he can from a well filled and indexed present volume of those same publications.

"C. A. STEDMAN, "The New Jersey Zinc Company."

NEW BOOKS

Analysis of Babbitt.—By James Brakes. Size 5½ by 7 inches. 168 pages including index. Bound in red cloth. Price $2.. Published by the Allen Book and Printing Company. For sale by The Metal Industry.

This book has been prepared with the idea of placing before the engineering and chemical profession a small practical work on the analysis and manufacture of babbit. The methods of analysis that have been selected from the many methods in use have been chosen for their simplicity, neatness and accuracy of analysis of a babbitt of known composition. In addition to the methods and instructions for analysis contained in this book, considerable chemical reactions and data have been inserted which will be of interest to the student of industrial chemistry.

Developing Executive Ability.—By Enoch Burton Gowin. Size 6½ by 9 inches. 486 pages including index. Bound in blue cloth. Price $3. Published by the Ronald Press Company. For sale by The Metal Industry.

This book is designed primarily for the young executive. It points out his opportunities and shows him how to develop and prepare himself for broader activities and greater responsibilities. The alert and ambitious business man, however, no matter what his position may be, will also find in it valuable and practical suggestions by means of which he can effect many economies of time, energy, and money.

It explains, concisely and interestingly, how the day's work may be so systematized that it can be cleared away with ease and precision, and, in addition, shows how the executive may utilize the time thus gained for constructive effort and for the development of mental vision, initiative, and reasoning power.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS: JESSE L. JONES, Metallurgical PETER W. BLAIR, Mechanical CHARLES H. PROCTOR, Plating-Chemical

CASTING

Q.—We are making a ring 5 feet in diameter, 4 inches thick and 22 inches deep in manganese bronze. We vent it close, use good open sand and have also skin-dried it. We gate it from the bottom with six inlet gates in cores one inch square, next the casting and two large risers, but we always get the same results sent back from the machine shop —small marks on the casting that do not machine smooth. We use a skim gate and cast level on the floor. We have also tried to make them 6 inches deep with the gates on the bottom, but get the same results. Our down gates are 3½ inches in diameter, running into a core gate with outlet next to casting, 1 inch square. The ring is cut up into rings 1½ inches deep and machined all over.

We now make the same ring 1¾ inches deep and have tried to gate it from the bottom with a skim gate with three inlets. We pour with three pots but the results are not very good as there is dross on top of the rings. Some of them we have gated with six ¾-inch gates on top in three places and find ⅜-inch shrink spots near the gates. We use the very best of metal.

We also make a gear blank, about one ton weight, in manganese bronze. We have four risers about 8 inches in diameter cut into side of the mold to bottom of casting to feed casting. We cast from bottom with three gates as above. As soon as the metal is in the risers we stop off the gates and fill up risers with hot metal about 10 inches above cope, yet we get holes like pin holes about 1 inch to 2 inches into castings.

A.—Manganese bronze has a shrinkage equal to that of steel. You have not made sufficient provision for this shrinkage and in addition your metal may not be right. Before pouring your castings, test your metal by pouring a test ingot 18 inches long, 2 inches wide and 1 inch thick. Nick this ingot and then bend and break it by sledging. If it is tough and strong and shows a fine, uniform grain with no lemon colored spots, your ingot has been well mixed and properly melted. If the fracture shows lemon colored spots or dross, of if the metal is brittle, the ingot is poorly made or has been burned in the melting and you cannot expect to obtain satisfactory castings.

A ring of the size you mention should have at least four large risers instead of two and the risers should be increased in height to correspond to the depth of the casting. For a ring 22 inches deep the risers should be 22 inches above the cope. With good metal and the above changes your rings ought to be all right from bottom to top. On smaller castings use letter S runner gates with finger gate inlets.

For gear blanks as heavy as one ton, chill if possible, the entire bottom, use segmental chills on the side and a large riser on top.—J. L. J. Problem 2,728.

CLEANING

Q.—We have quite a number of screw machine parts made from steel, which we nickel plate. We put these through an electric cleaning process, but find that there is a little sediment left on the articles. We believe there is some acid dip which would make these parts suitable for putting in a plating tank without scrubbing. Can you give us any information on this subject?

A.—It is not necessary to use an acid to remove the film, all you will have to do is to arrange your tank with a double throw switch so that the current can be reversed for a few seconds after cleaning. The articles then become the anode and the tank the cathode so the film will be removed instantly by the reversed current.

If you desire to use an acid dip to remove the film, if it is an oxide, then a mixture of 1 gallon of water and ¼ to ½-gallon of muriatic acid will be satisfactory. After immersing in the acid dip wash thoroughly and plate direct.

The double throw switch method would be the most economical to use.—C. H. P. Problem 2,729.

Q.—We make a large line of embossed letters and figures from sheet brass and aluminum. They vary in size from ½ to 6 inches. Many of these letters have to be polished and we wonder if you can recommend some formula for a material for removing the polishing composition that collects on the back of these letters without marring the polished face. We use Egyptian nickel polish as a buffing composition.

A.—It is somewhat difficult to remove polishing material from the back of embossed letters and figures that are made of brass and aluminum without marring the finished surface. There are, however, two methods which you might try.

First—Prepare a mixture of two parts of carbon tetrachloride and 1 part of benzine (this mixture is inflammable). Have receptacles for holding the mixture along side of each polisher so that the letters as they are polished can be dropped into the mixture while they are warm from the friction of polishing; the polishing dirt will then be dissolved at once. If sieve-like baskets are placed in the pans containing the dissolving mixture the letters can readily be removed and dried out in sawdust.

Second—Boil the letters in a solution of platers' compound, using about 4 ounces of soap per gallon of water. This soap solution should remove the buff dirt without injuring the polished surface. If a very slight tarnishing results after boiling out a very dilute solution of cyanide will remove the tarnish.—C. H. P. Problem, 2,730.

DEPOSITING

Q.—We have been asked to deposit lead on copper fittings to the thickness of the enclosed strip. Would you kindly let us know the formula for solution, and any other particulars necessary?

A.—Dissolve 7 ozs. of caustic potash or soda (soda equally good) and ¾ oz. litharge (lead oxide) in a gallon of water. Boil until lead salts are nearly all dissolved. Copper articles first, then plate slowly with frequent scratch brushings, and proceed as with tinning.—H. C. W. Problem 2,731.

FINISHING

Q.—We would like to have a formula for producing a patina finish.

A.—Either of the following formulas can be used to produce a verde green finish:

Tiffany Green.

Water	1	gallon
Copper sulphate	4	ounces
Sal ammoniac	2	ounces
Rock salt	1½	ounces
Sulphate of zinc	1	ounce
Acetic acid	1½	ounces

Verde Green.

Water	1	gallon
Copper sulphate	8	ounces
Sal ammoniac	5	ounces
Rock salt	4	ounces
Acetic acid	2	ounces
Copper carbonate	½	ounce

Immerse the brass parts in the dip for a short time, then remove, drain well and allow to dry until the green develops.

Then while still moist take a round painters sash brush about 1 inch in diameter and stipple the green to produce the variegated effect. For darker greens copper plate and oxidize the brass first and then immerse in either of the above solutions and finish as noted. Finally when the finish is dry, lacquer and wax down with a soft brush or goat's hair brush made especially for use on a regular scratch brush lathe.

If the green drys too rapidly add ½ ounce of glycerine per gallon of verde solution.—C. H. P. Problem 2,732.

OXIDIZING

Q.—We want to get a black oxidized finish on cold rolled steel bottle caps and would like to have your advice as to the cheapest and quickest process. These caps are intended for a new item which will be sold in big quantities at 10 cents and we, therefore, are looking for a very cheap process of oxidizing.

A.—There are several methods that you can use for producing a cheap gun metal finish on the steel caps, but these cheap methods are not always the cheapest in the end. You might try finishing them in the following manner.

1.—The most satisfactory method of cleaning would be to tumble them in quantities using a solution of

Water	1 gallon
Caustic soda	4 ounces
Sodium cyanide	1 ounce

After tumbling for about thirty minutes the articles would be sufficiently clean, after washing in water, for coppering by simple immersion or electro-copper-plating. You might use the following solution.

Water	1 gallon
Sulphuric acid	2 ounces
Copper sulphate	1 ounce

Immerse the articles in this solution for a few seconds or until uniformly coated with copper, then remove quickly and wash in water and then immerse in the following oxidizing dip.

Water	1 gallon
Polysulphide	¼ ounce
Ammonia water	Few drops
Temperature	120 degrees

After the gun metal has been produced remove, wash in cold and boiling water and tumble in hot maple sawdust. Finally lacquer with a cheap lacquer or the articles may be lacquered direct from the cold and hot water washings by using a water lacquer.

It is possible that in the end it will be cheaper and more satisfactory to use an electro-copper solution and also use a mechanical plating barrel.

Water	1 gallon
Sodium cyanide	7½ ounces
Copper cyanide	6 ounces
Soda ash 58%	3 ounces
Caustic soda 78%	¾ ounce
Bisulphite of soda	1 ounce

Use this solution at from 6 to 8 volts, normal temperature, the time of deposit being about 20 minutes.

After copper plating, wash thoroughly and oxidize and lacquer as mentioned above.

A gun metal finish may also be produced upon steel by the heat method. For this purpose an iron kettle should be arranged with facilities for heating, preferably with gas, to 600 degrees Fahr. The material used consists of crude sodium nitrate and to every pound of the nitrate add 1 ounce of black oxide of manganese. The steel articles should be clean and perfectly dry. Immerse the articles in the solution by means of iron wire baskets or ladles (perforated) for a minute or two or until a black gun metal finish is produced, then remove and immerse in water or paraffin or kerosene oil, and dry out as usual.

Similar results can be obtained by boiling the articles in an iron tank with steam coil connections so that a boiling temperature can be maintained. Use a solution of 1 gallon of water and 4 to 6 ounces of commercial phosphoric acid. Boil the articles for three hours and then wash, dry and lacquer as outlined.—C. H. P. Problem 2,733.

MELTING

Q.—Can you advise me as to the best method of melting "aluminum foil" off tea packages. I am told it is impossible to melt same in the ordinary crucible. I have several tons of the foil on hand.

A.—For melting "aluminum foil" proceed as in melting fine aluminum turnings. First prepare a bath of molten aluminum, preferably in an open flame furnace, although a crucible may be used. Into this bath work in this foil by the operation known as puddling. The temperatures of the metal should be kept low and a flux of zinc chloride, sal ammoniac, chloride of lime, etc., should be used, not as a reducing agent, but to allow the molten particles of the alloy to unite. Pour into ingots, analyze and use product where the analysis shows it can best be used.—J. L. J. Problem 2,734.

PICKLING

Q.—Can you recommend a pickle that will help clean the sand and scale from brass patterns.

A.—A pickle of dilute hydrofluoric acid is the best means of removing sand from castings or silicate scale that has been "burned" fast to castings. It will act on the sand in preference to the metal. If the solution is weak, the castings may be left in it over night.—J. L. J. Problem 2,735.

PLATING

Q.—How can a gray finish be obtained on automobile parts for the inside of limousines?

A.—Gray electro deposits can be produced by means of adding sodium arsenite to a silver solution. The exact amount of sodium arsenite to be added to the solution would have to be determined by experiment.

Electro tin deposits give an excellent gray tone when the deposit is brushed down similar to a brush brass and then finally lacquered. The silver deposit should also be finished in a similar manner.

A nickel solution can also be made to produce an excellent gray by adding common salt—4 to 8 ounces per gallon of solution.

The surface of the articles to be nickel plated should be first prepared as for a brush brass finish. The burning of the deposit must be avoided and after plating, the surface must be again brushed down with a tampico brush and pumice stone and finally lacquered. The solution used is as follows:

Water	1 gallon
Double nickel salts	6 to 8 ounces
Boracic acid	1 ounce
Common salt	4 to 8 ounces

Use a low current. This method gives an excellent finish and is most universally used for gray finishes. C. H. P. Problem 2, 736.

STRIPPING

Q.—We would like information concerning a stripping solution for removing the brazing solder from steel bicycle frames.

A.—In stripping brazing solder from steel it is necessary to arrange a small tank or a good size acid crock capable of holding a number of gallons. As a plating solution with a reversed current must be used it is advisable to have three poles. The centre pole would be the anode pole, upon which the articles to be stripped are placed and the two outside poles would be the cathode poles on each of which should be suspended plates of lead or carbon. The lead or carbon plates are negative or cathodes, the stripping pole, positive or anode.

The solution should be composed of 9 parts of sulphuric acid and 1 part of water and to every gallon of solution should be added from 1 to 2 ounces of glycerine. C. H. P. Problem 2, 737.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

The age of these patent notices is due to the delay in the issuing of patent reports.—Ed.

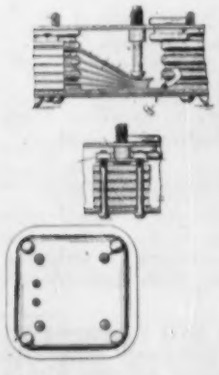
1,307,572. June 24, 1919. **Lighting-Fixture.** Harry C. Adam, St. Louis, Mo.

The main object of the present invention is to provide a lighting fixture of the general type that is designed for use with a concentrated filament incandescent lamp and which is constructed in a novel manner, as shown in cut, that insures the major portion of the horizontal, approximately horizontal and upwardly inclined rays emitted from the lamp being reflected downwardly into the useful plane.

Another object is to provide a lighting fixture having the characteristics above referred to that softly illuminates the ceiling above the fixture; that presents a neat and ornamental appearance; that can be manufactured and sold at a low cost; that can be taken apart and assembled easily and which is so constructed that the metal parts of same can be used successfully with different sized lighting units and different sized diffusing bowls by simply raising or lowering the part that carries the diffusing bowl so as to maintain the proper relation between the lighting unit, the diffusing bowl and the reflector which is arranged above the filament of the lighting unit.

1,307,643. June 24, 1919. **Rheostat.** H. D. Stone, New Haven, Conn. Assignor to A. C. Gilbert Company of the same place.

This invention relates to rheostats, and more particularly to rheostat adapted to control the speed of a small electric motor.



The object of this invention is to provide a small, portable rheostat that permits of a comparatively large range of current control, which is durable in use, and which may be manufactured at a relatively small cost.

A more particular object of the invention is to provide a small, portable rheostat which is adapted to be placed on the floor and operated by a foot treadle in order to provide a convenient means for controlling the speed of an electric motor.

To these and other ends, the invention consists of the novel features and combinations of parts as shown in the cut.

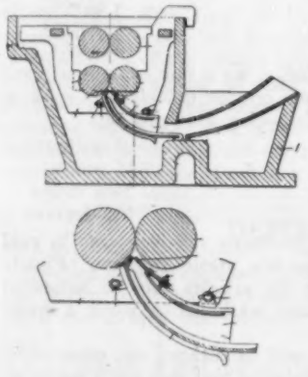
1,307,853. June 24, 1919. **Process of Alloying Zinc With Iron or Steel.** B. F. Dimm, Erie, Pa., assignor to C. A. Dimm, Trustee.

The inventor has discovered that any steel or iron object, after having its surfaces thoroughly cleaned of all scale and oily substances by "pickling" in suitable acid solutions and then provided with a coating of zinc by any one of the well known zinc plating galvanizing processes, may have the metal of the zinc coating absorbed into and mixed, combined and alloyed with the internal structure of the object, in whole or in part, from the surfaces of the object inward, so that the structure and appearance of the coating will be changed, and maintaining the object within such range of heat for an interval of time proportionate to the thickness of the zinc coating and of sufficient duration for the metal of the coating to be substantially all absorbed by the metal of the object.

The best results are obtained by inclosing the coated object in a retort and subjecting it to a heat of about 600° Fahr., for a period of about six hours, according to the thickness of the coating. When cooled and a residuum of dross is cleaned from the surface of the object, the surface will be found covered with a thin semi-transparent grayish blue film of carbonate of zinc, beneath which is formed an alloy of the metal of the iron or steel base with the zinc of the coating to a depth inward from the original surfaces of the iron or steel object of not less than the original thickness of the zinc coating, and generally to a greater depth.

1,307,832. June 24, 1919. **Apparatus for Coating Metal Sheets.** E. G. Porter, Woodlawn, Pa.

It is the object of the invention to regulate, and secure uniformity in, the thickness of the layers of coating metal applied upon the opposite faces of the sheet, thus effecting a saving in coating metal, as well as enabling the coating apparatus to be operated at an increased speed. It is particularly applicable to machines for applying a coating of tin to metal plates.

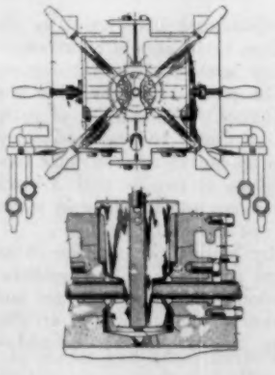


The patent covers:

In apparatus for coating metal sheets, as shown in cut, the combination with a coating-pot adapted to contain a bath of the coating substance, of a pair of relatively adjustable guiding-aprons provided with lips adapted to bear upon the opposite surfaces of the coated sheet as it emerges from the bath, at least one of said lips, being adjustable relatively to its apron, and means for securing the adjustable lip in adjusted position.

1,308,103. July 1, 1919. **Mold and Method of Casting.** F. A. Parkhurst, Cleveland, Ohio. Assignor to The Aluminum Castings Company of the same place.

This invention relates more especially to an improved form of mold gate, as shown in cut, and to an improved method of introducing molten metal into the mold cavity. While the invention, with respect to some of its features at least, is of general application, it has been developed in connection with molds for casting aluminum alloy internal combustion engine pistons and is especially applicable to the casting of cup-shaped and hollow cylindrical articles from metals or metallic alloys having relatively high crystallization shrinkages, such as characterize the aluminum alloys.



One of the objects of the invention is to avoid the formation of blow holes in the casting due to the oc-

clusion of air or other gases, such as hydrogen and nitrogen.

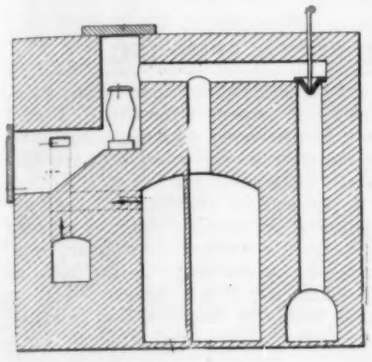
Another object of the invention is to avoid porosity and cracks in the casting due to crystallization shrinkage.

A further object of the invention is to reduce to a minimum the bulk of the gate metal of the casting.

1,308,190. July 1, 1919. **Crucible-Furnace for Melting Metals.** Paul V. Parsy, Paris, France.

In most furnaces at present in use for melting copper, brass, or other metals, the crucible is embedded in a mass of burning coke.

This method of heating the crucible necessitates on the part of the melter a special professional skill in attending to the fire.



On the other hand, the burning coke deteriorates rapidly the crucibles by the contact of these latter with the slag.

The present invention relates to a crucible furnace for melting metals constructed in such a manner as to obviate the inconveniences above mentioned.

The present kind of furnace, as shown in cut, is characterized essentially by the fact that it is heated by gas, with regeneration of the heat to heat the air supply, and that it comprises a combustion chamber and a smaller chamber arranged in such a manner that the flames may pass easily from the combustion chamber into the smaller chamber without being hindered by the residues of fused material or dross, which may be removed without impeding the working of the furnace.

1,308,524. July 1, 1919. **Method of Forming Sand Foundry-Cores and Substance for Use Therein.** Edouard Hamélius, Marseilles, France.

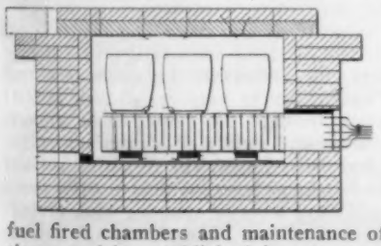
By this invention a carefully selected agglomerating liquid is intimately mixed with the sand by repeated siftings whereby each grain of sand is brought into contact with the air in order to facilitate the absorption of oxygen, that is to say the fermentation of the liquid. After a few hours a mastic will be formed which fixes the grains of sand in a solid mass which is for this reason capable of being handled and transported.

For this purpose it suffices to introduce into the boiled linseed oil about four per cent. of litharge which forms by fermentation a mastic which, on the heating of the core after the evaporation of the excess of linseed oil, gives the agglomerated mass a considerable degree of hardness enabling any framing to be dispensed with and thus greatly facilitating the molding of the recessed or grooved parts of all dimensions while resisting during the casting the strongest pressures and the highest temperatures.

1,308,880. July 8, 1919. **Electric Furnace for Fusing Metals Contained in Crucibles.** John Thomson, New York.

This is an invention in electric furnaces for fusing metals contained in crucibles.

The thermal element of the furnace is a carbon resistor of the zig-zag type, and among the objects to be attained the following may especially be mentioned: high thermal efficiency; the utmost simplicity; low cost of construction; increased endurance in the crucibles relative to those employed in fuel fired chambers and maintenance of the modes of manipulation usual in established foundry practice.

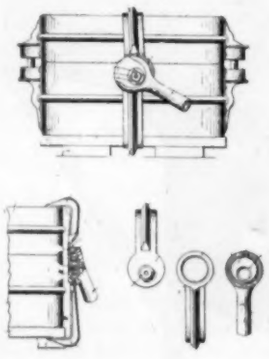


The patent covers: An electric furnace, as shown in cut, for fusing metals contained in a crucible, comprising a chamber, a zig-zag carbon resistor disposed along the bottom of said chamber to sustain the crucible, the upper surface of said carbon resistor having a greater current-density characteristic than its lower surface, said resistor transferring heat to the bottom of the crucible by direct conduction.

An electric furnace for fusing metals contained in a crucible, comprising a chamber, a zig-zag carbon resistor disposed along the bottom of said chamber, the upper surface of said resistor sustaining the crucible, and said resistor having vertically inclined sides for the transfer of heat therefrom by refraction to the crucible and the upper portion of the chamber.

1,309,613. July 15, 1919. **Foundry-Flask Clamp.** J. W. Dearsley of Racine, Wisconsin. Assignor to Freeman Manufacturing Company, of the same place.

This invention relates to new and useful improvements in clamping devices, and it is more particularly directed to the provision of a clamp adapted to secure together the sections of a molding flask or like structure.



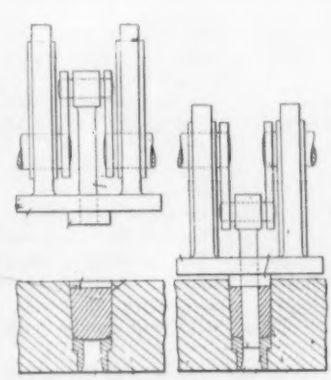
It is primarily the object of the invention to provide a device, as shown in cut, which may be most readily manipulated to procure and maintain the most efficient clamping action and which may be most readily released to permit disengagement of the articles held.

A more detailed object resides in the provision of a clamping device for foundry flask sections, which is connected with the sections by its clamping engagement and may be removed therefrom when not in use.

A still further object resides in the provision of a clamping device of this character which is exceedingly simple in structure and lends itself most readily to economical manufacture.

1,310,123. July 15, 1919. **Method of Forming Billets or Blooms for Forming Tubes by Extrusion.** J. W. Leighton, Toronto, Ontario Canada. Assignor to Pressed Metals Limited of the same place.

It has been found in practice that in order to form tubular metal articles by extrusion the billets or blooms require to be of very accurate dimensions and of uniform material and the principal object of this invention is to so treat the metal as to effectively size the billet and compress the material to a uniform state and to coincidently pierce the billet.



The principal feature of the invention consists in subjecting the billet of cast metal to a uniform pressure within a confined space and extruding the surplus metal from the billet by means of co-operating punches.

The press used is of any ordinary double acting form having the punch secured to the ram adapted to fit in to the top of the die recess to close the same. A central punch extends through the center of the ram-punch and is adapted to be operated with a movement following that of the ram-punch. The ram-punch closes the top of the die and the central punch passing through the die is forced into the metal.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

METAL PARTS WASHING MACHINE

The Nivin metal parts washer shown in the cut is claimed by the manufacturers, the Nivin Manufacturing Company, Chicago, Ill., to have reached the point of perfection in metal washing apparatus. Metal parts from the smallest screw machine parts to large castings can be washed in the Nivin machine. Instead of the parts being thrown about they are held stationary and are washed, as seen in the cut, by forceful streams of water coming from above and beneath. The process is thorough and instantaneous and transforms a dirty and distasteful task to clean and enjoyable work. The essential features of the Nivin machine as shown in the photograph are as follows:

THE NIVIN METAL PARTS WASHING MACHINE.

If so desired, metal parts can be rinsed with clean water after they have been thoroughly washed. Rinsing is optional and under the control of the operator.

Every metal part in the rack receives the direct force of the upper and lower wash. During washing process parts remain stationary, prevening injury to fine threads and edges.

This motor driven pump forces torrents of hot water through the revolving wash nozzles and against the metal parts cleaning them instantly.

The steam injector keeps the wash water at the proper temperature. If steam is not available, gas burners are supplied.

Upper wash nozzles are so designed and arranged that powerful streams of spraying water are directed against the complete surface of every metal part in the rack. The cleaning process takes less than twenty seconds for each rack.

Nivin racks are made of heavy, coarse wire mesh laid over a frame of armored wood. These racks will handle both small and large parts.

The lower revolving wash works in the same way as the upper wash. This double wash idea is a patented feature and has the assurance that all parts are quickly and thoroughly cleaned.

The lower rinse sprays the metal parts from beneath. As in the case of the upper rinse the use of the lower rinse is optional. It is used for giving the parts a final clean water bath wherever desired.

The water level over flow pipe is connected with the drain. Its purpose is to automatically drain from the surface of the wash water any oils which have been washed from the metal parts.

The entire machine is built clear of the floor and is easy to sweep or clean under. It is absolutely water tight, thus facilitating cleanliness and sanitation.

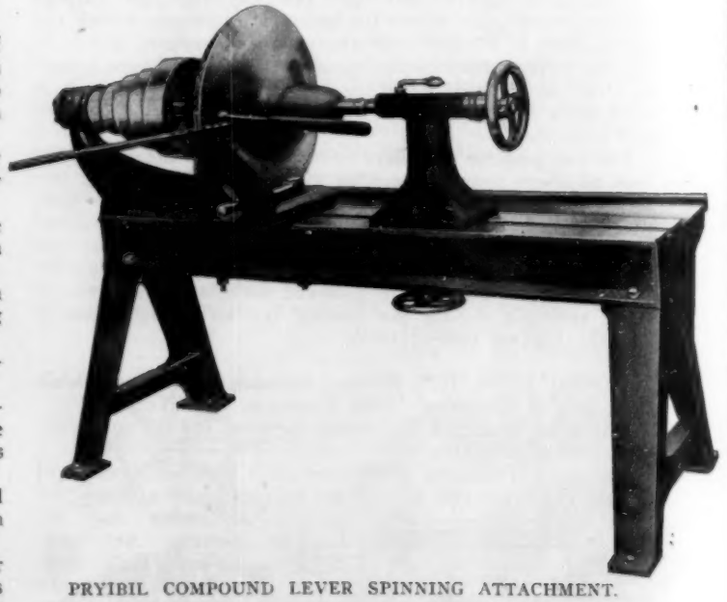
The Nivin metal parts washing machine is completely described in a little booklet called "Speeding Factory Production" which may be had upon request.

COMPOUND LEVER SPINNING

Although compound lever spinning has been done in this country for a good many years it has remained for the P. Pryibil Machine Company, manufacturers of metal spinning lathes, New York, to bring out forcibly the fact that this method of spinning may be applied advantageously in general practice. Heretofore the use of the compound lever tool in spinning had been resorted to only where the spinning or breaking down of a tough metal blank of extra heavy gauge by means of an ordinary spinning tool proved to be a physical impossibility; as for instance, a copper blank, 30 inches in diameter, B & S gauge, No. 16 or heavier, or a copper blank, 60 inches in diameter, B & S gauge, No. 8, both examples being comparatively easy problems for a compound lever.

The Pryibil Company has found that the compound lever spinning attachment shown in the cut, greatly adds to the efficiency of a metal spinner because it relieves some of the physical strain and enables him to keep the metal to the original thickness of the blank the entire length and to any depth of the draw, due to the blunt nose of the tool, and its peculiar manipulations. The essential details of the attachment designed for the larger size of spinning lathes are as follows:

It consists of a base plate with clamping plate with bolt, a rest bank and a compound lever, the right hand lever serving as a spinning tool. The base plate slides on the lathe bed with a heavy tongue within the bed opening. The rest bank in turn slides its entire length over a heavy tongue of the base plate at right angle to the lathe bed. The rest bank thereby receives a rectangular compound adjustment on the bed.



PRYIBIL COMPOUND LEVER SPINNING ATTACHMENT.

A clamping bolt projection through the slotted base allows clamping the rest bank instantly and rigidly by a fractional turn of its steel wrench at any desired position. The rest bank serves as a fulcrum for the main left hand lever; which in turn provides a fulcrum for the right hand lever or spinning tool, giving the same compound leverage and motion. The photograph shows

a copper blank 26 inches in diameter, B & S gauge No. 16, being spun over its wooden chuck on a 26-inch spinning lathe.

DIXON'S FOUNDRY FACINGS*

PURPOSE OF FACING.—Foundry facings are applied to the surface of molds for the purpose of preventing adhesion between the metal and the sand of which the mold is composed. When the facing performs this function properly, a casting is secured which requires little or no cleaning, thus effecting a great saving in the operating expenses.

The saving is not confined to the item of cleaning, but also appears in the reduced cost of machining due to the absence of burnt sand on the surface of the casting. When facings of the better quality are used, the castings are of that fine bluish gray color so much desired by the progressive foundryman.

The reason why a graphite or "silver lead" facing prevents the sand adhering to the metal is as follows:

Graphite is one of the forms of carbon and is a combustible material. When molten metal is poured into the mold, the air in the mold and the air carried in by the stream of melted metal furnish oxygen enough to bring about a certain amount of combustion, forming a gas between the metal and the mold. This effectually prevents adhesion of the metal to the sand, and just as long as the gas film exists no adhesion can possibly occur.

Pure graphite will not adhere of itself to the mold surfaces, but will run before the metal the moment the sand dries. To prevent this, it is necessary to add a binder to hold it in place. The proper proportioning and selection of this binder is a matter of the utmost importance. Facings with a large percentage of binder are more difficult to "slick" than those with a low percentage. Therefore they are indicated where the sand is used quite dry. It is common experience that facings used during the summer months with the utmost satisfaction, are found fault with when winter months come, because they don't "slick" well. This is most often experienced in foundries which are not well heated and which become unusually damp in cold weather. The sand does not dry out so rapidly as in the summer, and is consequently just a little damper when used. This accounts for a difference in the working of the facing.

KINDS OF MOLDING.—There are four general classes of work that require different treatment, viz.: green sand molding, loam molding, dry sand and core work.

Green sand molding is by far the most common, and is used for nearly all iron molding done in flasks. "Green sand" means damp sand that can be packed sufficiently hard to retain its shape. Facings are dusted on, and slicked by hand.

Dry sand molding differs from green sand in that after the mold is finished, the flasks are placed in a drying oven and thoroughly dried. Facing for dry sand is mixed with water and applied to the hard surfaces as a wash.

Core work. If the casting is to be hollow, a core of the proper form is suspended in the mold, so that after metal is poured the core can be knocked out and leave a hole of any desired shape within the casting. Cores are commonly made of flinty sand mixed with linseed oil or flour and baked hard. They are then coated with a graphite wash, the same as for dry sand work.

Loam molding, which is gradually being replaced by dry sand molding, differs from green sand work in that the molds proper are not contained in flasks or bedded in the floor, but are constructed in sections composed of plates, brickwork, etc., and lined with loam, which is a mixure of sand and clay. After molds have been built up, the loam is dried and washed with a mixture of charcoal and water.

GOOD FACINGS DESIRABLE.—Good castings depend largely upon good facings, or at least good castings are impossible with poor facings. On the other hand, it is necessary that the facing be available at a reasonable cost consistent with quality. Dixon's foundry facings meet this requirement and have been adopted in many foundries after a careful test alongside of facings whose first cost was considerably less, as it was unquestionably demonstrated that the cheaper priced facings were much more expensive.

The following data illustrates what we mean. In this test approximately 20 square feet of the mold were covered with each grade of facing, which accounts for the different weights.

*From "Graphite," issued by Joseph Dixon Crucible Company, Jersey City, N. J.

Number	Weight Used	Area Covered Square Feet	Lbs. Used Per 100 Square Feet
0322	10½ oz.	19½	3.36
6726	11½ oz.	19½	3.685
2441	7 oz.	19½	2.24
604	7 oz.	20	2.19

Number	Cost Per Pound	Cost Per 100 Sq. Feet	Finish of Mold	Finish of Casting
0322	4½c.	15c.	Poor	Poor
6726	6c.	22c.	Good	Good
2441	7c.	16c.	Good	Very good
604	7c.	15c.	Fair	Good

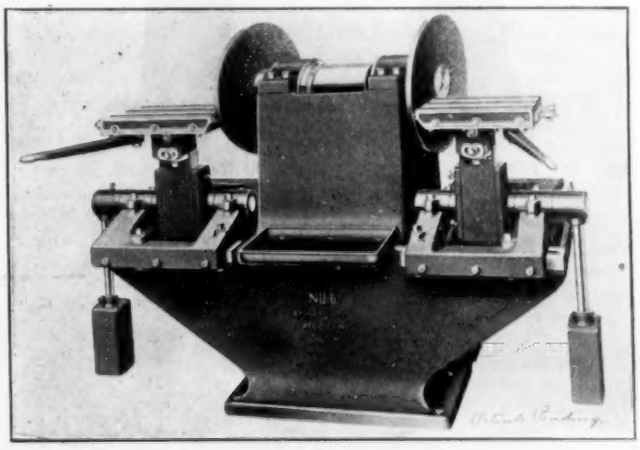
In this particular test, which was made on a large planer casting, No. 2441 shows up the best, and, naturally, this would be so, as No. 2441 is intended for heavy work. In the comparison of No. 0322 and No. 6726 the extra cost of the facing is more than made up by the finish of the casting, as the labor in cleaning a casting which has been faced with No. 0322 would be considerably higher than the extra cost of using No. 6726, which is only 22c. for 100 square feet.

This test has been made a great many times and it is the best argument for good facings that it is possible to get, as it proves conclusively that the most economical facing is the high grade lead, for it will cover a greater area per pound and give a better finish to the mold and the casting at a less cost than a cheap loaded facing. Another convincing test is to use a good Dixon lead on half of a mold and a competitive grade on the other half, and then compare results after the casting is made.

SINGLE SPINDLE DISC GRINDER

The photograph shows one of the single spindle type of disc grinders made by the Badger Tool Company of Beloit, Wisconsin. These machines embody a number of new and quite unusual points in this type of tool. The most important are perhaps the lever feed work table, ball bearing spindle mounting and the rocker shaft construction.

The lever feed table possesses a number of refinements such as an adjustably attached wheel truing device, a back stop and micrometer screw stop. An abundance of leverage is obtained through a toggle joint action requiring less physical energy on the part of the operator while taking heavy cuts. It will be seen that the pressure increases as the table approaches the grinding



BADGER SINGLE SPINDLE DISC GRINDER.

disc. In other words, the cut is started with light pressure and leverage increased after the sharp points have been removed from the piece being ground, thereby preserving the life of the grinding disc.

The ball bearing mounting is so designed that there is never any trouble caused by dust or grit, and provision is made for draining off lubricant and cleaning the housings.

In the ordinary type of disc grinder construction the rocker shaft is merely anchored in the machine base and the outside

ends of the shaft remain unsupported. In the Badger disc grinder the rockershaft is mounted in a saddle so that it has a rigid bearing support on each side of the box which supports the lever feed work table. This added rigidity not only makes it practicable to do accurate grinding, but because of the absence of vibration makes the abrasive discs wear longer.

These machines are built under patents granted to Edward B. Gardner, President of the Badger Tool Company.

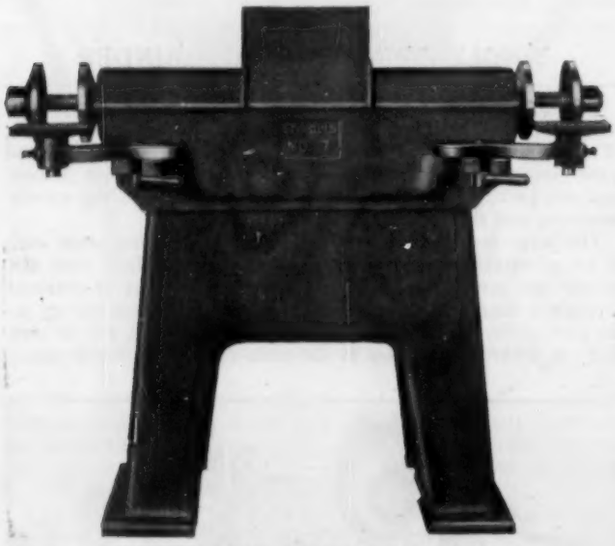
ST. LOUIS GRINDER

The grinding machine shown in the cut represents a new line of heavy floor grinders now being manufactured by the Saint Louis Machine Tool Company, St. Louis, Mo. In designing this line of machines they have endeavored to overcome the deficiencies hitherto found in this class of machinery.

By referring to the specifications it will be noted that the arbors are larger than usual, are .40 carbon steel, and have extra coarse pitch, square threads.

The best grinder practice transfers wheels to another machine belted at a higher speed, in preference to using cone pulley machine, avoiding the risk of accidents occasioned by starting new wheels on the fast cone. These machines are furnished with plain pulley, or cone pulley as ordered. Pulleys are extra large.

Bearings are extra long, have large oil chambers which are filled and drained through a pipe connection at the back, so arranged that the oil cannot overflow.

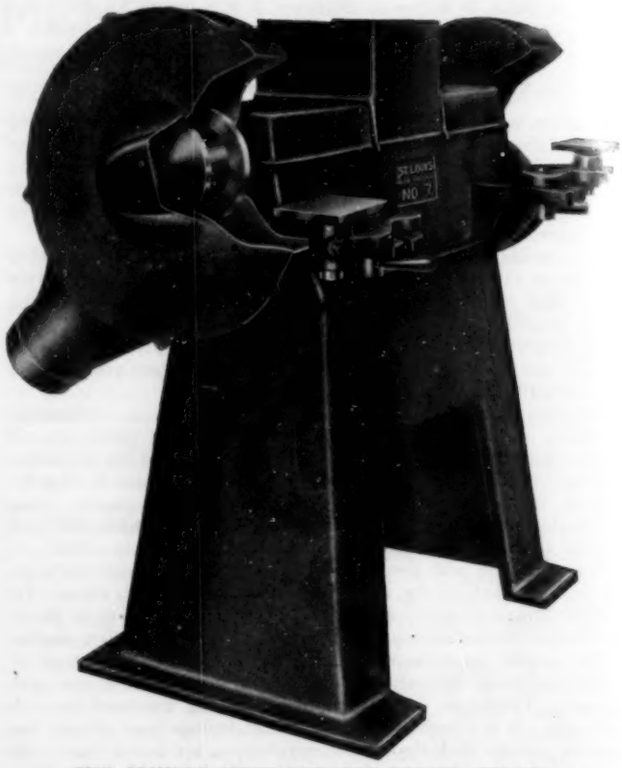


THE SAINT LOUIS HEAVY FLOOR GRINDER.

SPECIFICATIONS.

Machine	7	8	9
Wheels recommended	18x 3	20x 3	24x 4
Diameter arbor in collars	1½	1¾	2
Diameter arbor in bearing	1¾	2	2¼
Length of arbor	52	60	65
Distance between wheels	40	44	48
Length of bearings	12	12½	13
Height to center of arbor	34	34	34
Size of base	23x24	23x24	25x38
Plain pulley	7x 5	8x 5½	9x 6
Cone pulley	6x 5	6x 5½	7x 6
Speed of C. S.	465	382	358
C. S. drive, plain	16x 5	20x 5½	20x 6
C. S. cone	17x 5	22x 5½	22x 6
C. S. T. and L.	8x 5½	10x 6	10x 6½
Drop of C. S.	12	12	12
Shaft	40x 1½	40x 1½	40x 1½
Weight, machine	700	775	1,000
Weight, C. S.	200	250	250
Total	900	1,025	1,250

Cone pulley on machine and countershaft will add about 50 pounds to weight.



THE GRINDER WITH EXHAUST WHEEL GUARDS.

HUNDREDTH ANNIVERSARY OF THE PECK, STOW AND WILCOX COMPANY

On August 29 and 30, 1919, an elaborate hardware exhibit will be staged at the plant of the Peck, Stow and Wilcox Company, manufacturers of hardware, at Southington, Conn.

The exhibition will be conducted in connection with the company's celebration of its one hundredth anniversary in the hardware business, which started with "Peck's Patent," consisting of Seth Peck's invention of a tin-folding machine in 1819. From this modest beginning grew the business which has made the "Pexto" brand of tool a familiar and well-known article of trade in every country in the civilized world.

The Peck, Stow & Wilcox Company, at the same time, will present to the town of Southington, Conn., a soldier memorial consisting of a flag pole with a stone and bronze base on which the names of Southington's soldiers of the great world war, the Spanish-American, Civil, Mexican and Revolutionary wars and the War of 1812, will be cast in bronze.

This presentation will form the basis of a huge town celebration on the same dates in Southington, at which the principal speakers are scheduled to be Secretary of War Newton D. Baker, Governor James M. Cox, of Ohio, and Governor Holcomb, of Connecticut. Governor Holcomb heads the executive committee in charge of the town celebration and elaborate plans for the celebration already are well under way.

The tool exhibit will be displayed in the Peck, Stow & Wilcox Company's new plant addition and will consist of tools of every description and show some of the earliest samples of each, some of them being one hundred years old. Each tool will be shown in the various stages of its development to its present state of efficiency by old models so far as those models were procurable. Already a remarkable array of these old tools of varying ages have been secured.

The industrial history of the State of Connecticut and of the town of Southington will be depicted in a big pageant which precedes a big military parade on the second day of the celebration. The first day will be devoted to a program incidental to a gigantic community picnic for which a number of spectacular events have been planned. It is expected that the big outing will attract people from all over the State of Connecticut.

CHOOSING THE RIGHT LACQUER*

Almost all lacquers look alike. Apparently they are simple in composition and easy to manufacture. But did you ever stop to consider the great variety of articles on which lacquers are used? Builder's, trunk and fancy hardware; lighting fixtures; silver and gold novelties, and countless articles made from all kinds of woods, from celluloid, and even from glass. In addition, there are many different grades and finishes: Solid, plated and filled metal, rough brush, smooth, polished, antique, etc. The variations are almost unlimited.

Different types of articles require different lacquers, and to furnish just the proper lacquer for the purpose, the lacquer manufacturer must carefully consider the character and composition of the article, the nature of the finish or surface to which the lacquer is to be applied, the kind of finish desired on the lacquered article, and the conditions in the shop in which the lacquer is to be used. Then—and not until then—is the manufacturer in a position to select or develop the lacquer that will give the best results.

The best general purpose lacquer is of the pyroxylin type. These lacquers are the toughest and most durable, and are always used for high-grade work. They are furnished clear or in colors, and for application by spraying, dipping or brushing. They should be applied only on work that is perfectly clean and dry.

Then there are the water-dip lacquers, which are combinations of gums and solvents, and do not contain pyroxylin. They cover more surface per gallon, but are not as tough or durable as lacquers of the pyroxylin type. They may be applied only to metal, and are used mostly on cheap plated goods, such as trunk hardware. Articles may be dipped right from the rinsing water into the lacquer tank, and the water that is in this way carried into the lacquer separates and settles to the bottom, from which it is removed either by siphons or a pet-cock provided for that purpose.

Gum-dip lacquers are practically the same as water-dip, excepting that they can be used only on dry work. They are still cheaper, and are applied to the cheapest wood or plated metal articles.

Manufacturers using lacquers in their business, sometimes make complaints as to the quality of lacquers. Investigation will usually show that unsatisfactory service has been due to the selection of the wrong grades of lacquers. If the manufacturer would be perfectly frank with the lacquer man and tell him just what is the type and composition of the article to be lacquered, he would undoubtedly be sold a grade of goods that would be entirely satisfactory. In other words, what the lacquer manufacturer must know is this: If the material to be lacquered is a metal, what kind? Is it solid or plated? If the material is wood, what kind and what is the character of the surface to which the lacquer is to be applied? Also is a lacquer desired that will deposit a film that is practically invisible yet one that will water-proof the article, or is it merely desired to produce a high gloss finish?

It is also important to know whether the lacquer is to be applied by spraying, dipping, or brushing; whether the manufacturer desires to produce an article of the highest grade of durability, a medium grade, or a cheaper grade.

If the manufacturer of the goods on which lacquers are to be used voluntarily decides to cheapen his product by using a cheap lacquer, he should not pass the blame along to the lacquer manufacturer, if his goods fail to give perfect satisfaction to the consumer, for he must remember that the lacquer man is probably in a position to supply something that will stand up if he is willing to pay the price for the right goods.

*E. I. Du Font de Nemours & Co., Wilmington, Del.

ASSOCIATIONS AND SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

FIFTH NATIONAL EXPOSITION OF CHEMICAL INDUSTRIES

The forthcoming National Exposition of Chemical Industries at the Coliseum and First Regiment Armory, Chicago, Ill., during the week of September 22 to 27, inclusive, holds possibilities of as great benefit to American Chemical Industry as in the past during the war period when it contributed so directly to the firm establishment of a chemical industry in this country. This exposition will prove that the chemical industry in this country is advancing with leaps and bounds, that the industries are flourishing and that the end is not yet in sight. It will show what optimism has done for the country and what a continued spirit of optimism can do.

One feature of the coming exposition will be the number of electric furnace exhibits; all the foremost companies will be there: the activity of the war period produced an increased interest in metals, not only in new alloys and in treatment of metal but in the method of manufacture. It is a sign of the times that earlier interest in electric furnaces which was of a scientific interest, now has an industrial interest and plant men all over the country are turning their attention to this developed means of smeling and melting metals. On exhibit there will be the Rennerfelt furnace handled in America by Hamilton & Hansell; the Bailey furnace by the Electric Furnace Company; the Taylor furnace by the Industrial Electric Furnace Company; the Detroit rocking furnace by the Detroit Electric Furnace Company, and the furnace of Booth Hall & Company, and speaking of metals there will be some revelations in the line of metals, acid and alkali proof bronzes that are prepared for specific purposes that even quite recently were unheard of; there will be exhibits of bronze of such hardness and strength that instruments made of it are used to cut chilled steel; this performance exceeds even the fabulous bronze of the Egyptian which history has recorded of hardness sufficient to make chisels. The exposition will prove that modern metallurgy and the chemistry of metals has made quite as gigantic strides in the last few years as modern organic chemistry. Much of its wartime developments could not be made known till now and the exposition offers the first public introduction.

The advancement of electrochemistry particularly as related to electric steel, brass, bronzes, and the furnaces used has created a broader interest than in the strictly electrochemical field.

AMERICAN ELECTROCHEMICAL SOCIETY

The tentative program for the Chicago, Ill., meeting of the American Electrochemical Society, September 23-25, 1919, has been announced by the board of directors. Several sessions will be held jointly with the American Institute of Mining and Metallurgical Engineers, which meets in Chicago during the week of September 22

On Tuesday, September 23, the Society and Institute will go by boat to Gary, Ind., for inspection of the plant of the United States Steel Corporation. A symposium on electric steel will be held on the boat and continued at the Congress Hotel in the evening.

Wednesday morning the Society will hold a general session and in the afternoon a joint session with the A. I. M. E. in a symposium on non-ferrous electro-metallurgy. In the evening a special visit will be made to the electric furnace display at the National Exposition of Chemical Industries at the Coliseum.

Thursday will be devoted to a symposium on catalysis, to be followed by a smoker in the evening.

On Friday the Institute may hold its symposium on pyrometry, to which members of the Society are invited.

Headquarters of both the Society and the Institute will be at the Congress Hotel, and according to present plans all sessions will be held there.

The American Electrochemical Society's headquarters at the Chemical Exposition will be Booth 229, on the balcony of the Coliseum.

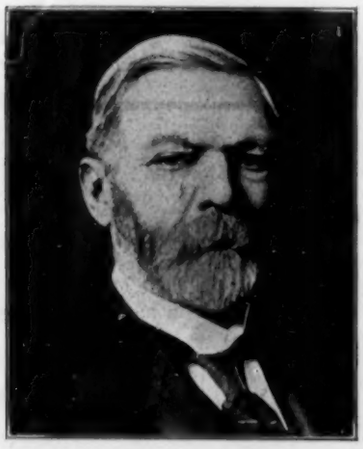
PERSONALS

ITEMS OF INDIVIDUAL INTEREST

COLONEL W. A. ROEBLING

Colonel Washington A. Roebling, one of New Jersey's most distinguished citizens, recently celebrated his eighty-second birthday. He is at the head of the John A. Roebling's Sons Company, Trenton, N. J., and has been connected with the big concern for the past sixty-two years.

Colonel Roebling was born at Saxonburg, Butler County, Pa., the son of John A. and Johanna Roebling, on May 26, 1837. When a boy he attended the public schools of his native town and after graduating from the high school he entered the Rennsselaer Polytechnic Institute, Troy, N. Y., from which he was graduated in the engineering class in 1857. Immediately after graduation he entered his father's mill in Trenton to learn the business and began the work of bridge construction and the building of huge copper cables. The same year he graduated he joined his famous father in the construction of the bridge over the Allegheny river in Western Pennsylvania. When the Civil War broke out in 1861 he enlisted in the Union army as a private and was later promoted to brevet general. Later he was made a colonel. He remained in the army for four years and when the war closed in 1865 he returned to the mill again. The same year he was sent West to assist his father in the building of the Cincinnati and Covington bridge, running between Ohio and Kentucky.



COLONEL W. A. ROEBLING.

A few years later John A. Roebling began the construction of the famous Brooklyn bridge and on July 22, 1869, he was injured while working on the structure and died as a result. The big structure was then left in the hands of Colonel Roebling. The latter had by that time became famous as an engineer and he tackled the big job himself and completed it successfully. The bridge was the greatest of its kind ever erected and won fame for Colonel Roebling. While this huge suspension bridge was being erected the Colonel's two brothers, Charles G. Roebling and Ferdinand W. Roebling, remained in Trenton and looked after the manufacturing of the cables and other material necessary for the bridge. Since that time the concern has erected many big suspension bridges and has established branches and offices in all the principal cities of the United States. It was while Colonel Roebling was in the army that he won his title for distinguished services. He first achieved distinction when, as a member of General McDowell's staff, he directed the construction of a suspension bridge, 1,200 feet long, for the transportation of troops over the Rappahannock. He is the author of "Military Suspension Bridges" and a number of other books on scientific matters.

Colonel Roebling has done much for the city of Trenton, but declines publicity on what he gives. Although he possesses the best in the line of automobiles, he does not care about motoring. After spending a few hours at his big manufacturing plant each day he returns to his mansion, 191 West State street, and spends most of his time in retirement. His hobby is taking walks near his home and is always accompanied by "Billy," his pet airdale dog. The Colonel's only child is John A. Roebling, of Bernardsville, N. J.

The Roebling Company has grown rapidly during the past years and is rapidly adding to its holdings. A few years ago the company laid out the town of Roebling, N. J., and the concern besides building a mammoth plant there erected homes for its 2,500 employes. The company is one of the largest producers of copper and brass in this section.

James Downey, Sr., formerly foreman plater for the Elite Novelty Company of Newark, N. J., has resigned and is now supervisor of the plating department of the Otto Heineman Phonograph Supply Company, also of Newark, one of the largest phonograph supply manufacturers in the country. This company is erecting a new building at a cost of $1,000,000 at the corner of Thomas and Gobel streets, Newark, which they expect to take possession of September 1, 1919.

Announcement has been received in this country of the marriage of **Major deCourcy Browne** and Madame Paule Lautier Aubard in Paris, on June 7, 1919. Major Browne was connected with the Ordnance Department during the war, and was sales manager of the non-ferrous department of the Metals and Thermit Corporation of New York, before entering the service.

Jonathan Bartley, the well-known crucible manufacturer, is now located at 50 Church St., New York City, as manager for George F. Pettinos, Importer and Refiner of Graphite and Foundry Supplies.

James Savage, former owner of James Savage & Company, brass founders, of Brooklyn, N. Y., is now connected with the Atkinson Company, manufacturers of plumbers' supplies, Rochester, N. Y., as foundry superintendent.

A. B. Seelig, formerly vice-president and sales manager of the Bristol Brass Company, Bristol, Conn., is now connected in a similar capacity with the Michigan Copper and Brass Rolling Mills, Detroit, Mich.

Joseph Haas, Jr., recently returned to this country after having served as Sargeant with the Overseas Surgical Instrument Repair Unit of the American Expeditionary Forces in France.

Francis A. Shepherd, Sergeant Senior Grade, Section 15, 328 Repair Unit M. T. C., Le Man Provisional Battalion No. 255, has returned to this country and has been mustered out of service.

DEATH

OTIS S. NORTHROP

Otis S. Northrop, prominently connected with several of the largest metal industries in New England, died suddenly at his home at Waterbury, Conn., on July 20, from a hemorrhage of the brain. He was a director and president of the Plume and Atwood Company, of Waterbury, Conn.; a director of the Clark Brothers Bolt Works, of Southington, and of the American Hardware Corporation of New Britain, aside from being prominent in banking circles and in the public life of his city.

Mr. Northrop was born in New Haven, Conn., December 14, 1853. When he was fourteen years old, he moved with his parents to Waterbury, where he later was in partnership with his father in the firm of C. S. Northrop & Son.

Mr. Northrop completed his education with a year in Germany and after his return married Eleanor Canfield, of South Britain, on August 17, 1881. Six years later he left Waterbury and engaged in business in Boston. Returning to Waterbury he retired temporarily from an active business life.

In 1896 he was elected trustee of the Dime Savings Bank and two years later its secretary and treasurer. He was elected its controller January 10, 1917, being succeeded in his position as secretary and treasurer by his son, Edwin C. Northrop. He was also vice-president of the Fourth National bank, which was finally liquidated and its business taken over by the Colonial Trust Company, of which Mr. Northrop was elected treasurer, later becoming president.

TRADE NEWS

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

WATERBURY, CONN.

AUGUST 4, 1919.

The eight-hour day with liberal increases for all of the workers in Waterbury's brass factories, who but recently returned to work after a strike of nearly three weeks' duration, is the rule in this city. The increases granted to the employees here in answer to their demands is said to be almost unprecedented in manufacturing history of New England. Practically all of the manufacturers granted an increase of 10 cents an hour to common laborers and one of 25 per cent to workers earning over 40 cents an hour. The granting of an eight-hour day was accompanied also by a concession of time and one-half for overtime.

In spite of this liberal increase, unskilled labor is not making $40 a week in Waterbury, as reports have said since the strike settlement. Facts gathered from the factories and from the employees show that the unskilled laborer who was receiving an average wage of 35 cents an hour for a ten-hour day is now receiving 45 cents an hour with $1.35 for the two hours over the eight-hour day. This brings the daily pay to $4.95 a day or $1.45 more than before the strike.

Unskilled labor is therefore getting on an average for a 60-hour week a pay envelope containing $29.70. In the case of a mechanic, who was making 60 cents an hour before the strike and who gets 75 cents now for an eight-hour day and works an average of nine hours a day, the strike has meant a raise of $2.17 a day. His weekly wage is now $47.22, as compared with the $34.20 he was getting for a 54-hour week before the strike.

Piece workers have been given a raise of 25 per cent a day. The average pay for girls has been $2 a day. It is now 50 cents more, which means a weekly wage of $15 instead of $12.

The lead in giving this material increase to employees was made by the three largest companies, the American Brass Company, the Scovill Manufacturing Company and the Chase Companies. It is reported that several of the smaller companies are facing a serious situation and that they may be forced to move away from Waterbury to some city where the wages are not so high. These factories are under long contracts to produce certain goods at a certain price. If they cannot do this with a reasonable margin of profit in Waterbury, they will leave for some city where they can.

One result of the success of the strike has been an increase in prices and rent, with an extensive investigation by the Chamber of Commerce.

Another result has been the organization of Waterbury workers, some joining the American Federation of Labor, and others a recently organized Waterbury workers' association. The local organization now numbers about 1,000, with more workers joining daily. Nearly seven hundred joined the national association. I. M. Ornburn, state secretary of the Federation of Labor, with other agents has been working for a more extensive organization here.

Railroad problems in relation to Connecticut industries were discussed at a meeting of state manufacturers in New Haven recently. John A. Coe, vice-president of the American Brass Company; John H. Goss, of the Scovill Manufacturing Company; B. I. Spoch, from the Waterbury Manufacturing Company, and other Chase Companies; M. A. Woodwel, of the Connecticut Bureau of Investigation; P. W. Brown, Chase Metal Works; Leroy M. Gibbs, Chamber of Commerce; John W. Potter, Randolph-Clowes Company; John B. Heffernan, Scovill Manufacturing Company; John P. Elton, American Brass Company; George W. Oliver, Gilbert Clock Company; C. H. Granger, Waterbury Tool Company; Charles P. Haight, Waterbury Tool Company; Robert D. Booth, Berbecker and Rowland Company, and L. J. Hart, of the Patent Button Company, were among those from Waterbury at the conference. The closing of the Government Employment office here has resulted in its work, particularly in regard to returning soldiers being taken up by the Y. M. C. A. and Chamber of Commerce.—D. H. P.

BRIDGEPORT, CONN.

AUGUST 4, 1919.

This city is once more the scene of considerable labor trouble, started apparently by the strike of the corset workers in the Warner Brothers Company, and extending since that time to a great many shops and factories of the city. The notable feature about all the strikes which have so far occurred is that the ruling of the War Labor Board, made here some months ago during the war-time labor troubles, has seemingly been disregarded by the employes.

At that time the "shop committee" plan was inaugurated in all those factories in the city working on government contracts, which meant practically every shop in the city. This plan was evolved to prevent just such strikes as have been happening during the past week or two and it was agreed by both manufacturers and labor that they would abide by the plan.

Now, however, it would seem that the labor element has taken the bit in their teeth and thrown this system to the winds as in several of the recent strikes there has been absolutely no attempt at mediation or conference before the strike has been called. In several of the strikes the first intimation the manufacturer has had of trouble was when the workers filed out of the shop.

As in most strikes, wages and less hours for work, form the principal bone of contention. Increases of anywhere from 10 per cent to over 50 per cent have been asked in different shops, while considerable agitation is going on over the 44-hour week question. In some cases the wage situation has been cleared up by concessions from the manufacturers but the 44-hour week problem is seemingly still an open question.

Individual manufacturers of the city claim that the question is one of state, or even nation, wide importance and should not be applied to individual factories of the city. The issue has been sidetracked in one or two of the cases but will undoubtedly crop up again either at the present time or in the immediate future.

The series of strikes which has invaded the city started with either a strike or a lockout at the Warner Brothers. The question as to which it was has not been decided definitely to the satisfaction of all. The strike then spread to the Batchelder and Crown Company and to the La Resista Company, from there involving the Birdsey-Somers Company. The strikes at the first three mentioned places have already been settled and it is thought that by the time this appears the Birdsey-Somers Company will have settled its difficulties.

No sooner, however, had the corset strikes been in progress for a few days than the unrest spread to the rest of the factories in the city. Among those plants involved in strikes or demands by labor are the following: Bryant Electric Company, Hawthorne Manufacturing Company, Graphophone Company, Hamel Shoe Machinery Company, Bridgeport Brass Company, Criterion Manufacturing Company, and the Monumental Bronze Company. There is also a report of demands made at the plant of the Crane Company and a strike there is possible at any time.

So far there has been no disorder of any serious nature at any of the walkouts and the chances are that all the strikes will be conducted in a peaceable manner. At one time police reserves were called to the plant of the Bryant Electric Company, where some of the women employes were said to be creating a disturbance but the arrival of the police promptly broke up the mob which retired peacefully.

The 44-hour week problem is apparently the most serious issue of the strikes and has not been settled satisfactorily by any of the manufacturers. At present the strikers seem not to be pressing this part of the issue but it would not be a bit surprising if, when the wage increases are either granted or denied, that this question will once more claim the attention of both parties.

The closed shop principle has also taken up considerable time in the conferences between strikers and employers. It seems to be the sentiment of most of the manufacturers where the closed shop idea has not been in force to continue as they have been.

In one or two instances a "preferential union shop" idea has been granted, but an absolute "closed shop" agreement has not yet been made with any company.

Regarding the unemployment situation in Bridgeport it can be truthfully said that the city is not solving the problem in as near a satisfactory manner as was first expected. The Welcome Home Employment Bureau is doing all in its power to place returned service men in positions, but they claim that the fullest co-operation has not yet been given by employers of labor. Sixty-three men were placed by the bureau yesterday and the average for the past month has been about that number, or possibly a little higher.

There are enrolled at the bureau about 750 men seeking employment, but positions are scarce and the bureau is hard put to it to secure positions for all who apply. Some of the shops here recently sent out a call for a limited number of skilled mechanics of various sorts, but the positions were soon filled and did little to relieve the pressure of unemployment.

It is estimated that about 2,000 Bridgeport service men will return to this city within the next month, and if this estimation proves correct the labor condition then will be even more unsatisfactory than it is at present. In justice to the Employment Bureau, however, it must be said that it is doing the utmost in its power to place all men, and if it does not meet with complete success it cannot be blamed. The blame either rests on the reluctance of employers to send in their requisitions or on a real scarcity of positions. L. M. P.

TORRINGTON, CONN.

AUGUST 4, 1919.

In order to fight the high cost of living, factory workers of Torrington have arranged for the organization of a co-operative store. This store, it is announced, will carry all kinds of food, certain articles of clothing, dishes, cooking utensils, etc. The business will be run on a no-profit basis, the only addition to wholesale prices being a percentage to cover the cost of conducting the store, and to guard against a loss through spoilage. The committee plans to buy in such large quantities that the goods may be sold at prices very close to those charged by the producers and wholesalers. Insofar as possible the goods will be purchased from the producers. The facilities of the store will be available to all working people regardless of the shops in which they are employed.

About forty automatic screw machine operators employed at the Standard plant of the Torrington Company went on strike during the past month for more pay. The difficulties were adjusted in a few days. This was the only strike to occur in Torrington. It was not marked by disturbances or disorder of any kind.

Employes of the Coe Brass Branch of the American Brass Company benefited by the increases given at other branches of the company where strikes occurred. Twenty-five per cent increase was awarded to all employes earning 40 cents an hour or more. Those earning under 40 cents were given an increase of 10 cents per hour. Office workers are also receiving more pay.

Increases in pay were given in all departments of all the metal working plants in Torrington during the past few weeks. These were necessitated because of the tremendous increase in the cost of living.

The death occurred at Bethlehem, Pa., during the past month of General W. E. Doster, father of Wadsworth Doster of the Torrington Manufacturing Company, and of Alexis Doster of the Union Hardware Company. General Doster was 82 years old and served as a brigadier general in the Civil War. He was a graduate of Yale, Harvard Law School and Heidelberg, and was attorney for the Bethlehem Steel Company and other corporations.

A certificate of incorporation has been filed by the Borgeson Manufacturing Company of Torrington, manufacturers of universal joints and other metal products. The authorized capital stock is $50,000, divided into 2,000 shares of $25 each. The incorporators are John Kennedy, James L. Green, Richard J. Kennedy and James J. Green, all of Torrington. The company's plant is on Monroe street.

The salesmen of the Union Hardware plant held a three-day conference here during the past month. The conference closed with a banquet in Waterbury. Those present were: F. J. Damon, C. G. Hoerle, Charles S. Gallagher, Harry F. Burgess, Lloyd Middlekauf, W. H. Thompson, F. M. Bither, Fred J. Rudden, Alexis Doster, John B. Gaynor and Harry A. Mink. The salesmen of the National Sweeper Division of Torrington Company also held a conference here.

The Torrington office of the United States Employment service has been closed after several months of valuable work. The Employers' Association has taken up the task of placing returning service men. R. Dunscomb Sanford, superintendent of the employment office, prepared the following statement for a representative of THE METAL INDUSTRY:

"In the nine months of service there were over 5,500 registrations and 5,350 placements. Among these placements were over 500 farm hands placed on farms in the county.

"Due to the co-operation of the manufacturers of Torrington, also throughout the county, there were only nine soldiers who had not been placed in satisfactory positions after registering with our office.

"I wish to take this opportunity to express my appreciation of the courtesy and kindness extended to me throughout the term of my office by one and all interested.

"Litchfield County's employment service office has as good a record in all lines as any in the State. The placements of returned army and navy men are far better than those made by any other office in the State, due largely to the co-operation of the manufacturers."—J. H. T.

NEW BRITAIN, CONN.

AUGUST 4, 1919.

While the metal manufacturing concerns of New Britain have not been disturbed by any of the serious strikes and labor troubles that have hampered so many of the plants throughout the East, there has, nevertheless, been an under current of unrest among the laboring classes in which higher wages has been the dominant note. At the P. & F. Corbin division of the American Hardware Corporation there has been a strike involving the iron molders, and for a time that part of the plant was crippled for more than a week before adjustments were made. But a short time later a similar strike occurred among the molders at the Union Manufacturing Company, and it was several days before peace again ruled. While these are the only two instances in which there has been an actual walkout the spirit of unrest has been noticeable, and it has not passed unnoticed by the employers.

At the Stanley Rule and Level Company announcement has been made that beginning August 4, the entire concern would go onto a new schedule wherein the basic working day would be eight hours. The plant will, however, work ten hours, and all day workers will be paid time and a half for overtime, thus the workers will be paid eleven hours pay for ten hours work. Another indication of the employers making every effort to keep the employes satisfied is seen at the P. & F. Corbin division of the American Hardware Corporation. Here the pay of the entire factory has been revised upward, and, it is said, the increase will average about 10 per cent. At Landers, Frary & Clark's individual departments have expressed dissatisfaction and more agreeable wage agreements have resulted. Also, at the Fafnir Bearing Company one small department has had some disagreement over prevailing scale of pay. At the Corbin Screw Corporation also, it has been reported that there are some departments that have made known their dissatisfaction.

On the other hand, business is very good in all of the factories. At the Traut & Hine Manufacturing Company plans are under way for reopening the branch factory at Collinsville. Landers, Frary & Clark have built several small additions, one in Plainville, and finds itself unable to keep up with orders for cutlery, table hardware and other domestic articles, to say nothing of not being able to put stock into the stock rooms.

The New Britain Machine Company is also doing a good business. All of the government contracts are to be terminated on August 1, and the concern will then devote its entire energy to its peace time products, specializing in factory furniture, automatic screw and chucking machines, as well as conducting its experiments with the new farm tractor. A screw products division, recently started, is another big factor in this concern. The big government factory, erected two years ago to handle the big contracts is to be razed, and all the machinery and left

over equipment is being sent to the army arsenal at Watertown, N. Y.

In addition to the old and established concerns that are doing a good business here, and are looking forward to not only developing the already growing South American trade, but also to work up a new and larger European business there is a new concern. It is the White Eagle Manufacturing Company, located on Washington street. It is managed entirely by Polish capital and its products will consist of all varieties of cutlery.—H. R. J.

WORCESTER, MASS.

AUGUST 4, 1919.

There has been little change in the industrial situation in this city. There has been, during the last part of July, a noticeable decrease in the number of labor troubles and strikes, though some of the strikes, which have been on for several weeks, are still on. The biggest strike of the number is that which at the Graton & Knight Manufacturing Company, largest manufacturers of leather belting in the world. About 2,000 men are out. The company runs a bicycle saddle business in connection with its other lines.

The molders strike, in which about 700 men are out, is still on. Likewise the equity court proceedings in connection with the strike also are on.

But the larger concerns in the city and in surrounding manufacturing towns are having little, if any, trouble. In the towns surrounding Worcester, the only real labor trouble of any consequence has been at the Palmer plant of the Clinton-Wright Wire Company, where there was recently a lockout of 300 employes. This has now been settled.

The contract to built a manufacturing plant and boilerhouse for James Smith & Son, machinists, at an estimated cost of $38,000, has been let to E. J. Cross Company of Worcester. The building is to be of brick, mill construction, with concrete foundations, two stories high, 212 by 60 feet. New machinery for the various kind of tools manufactured will be used to equip the plant.

The M. S. Wright Company, 51 Jackson street, has added to its plant the space in the building at 47 Lagrange street. The company manufactures vacuum sweepers. The new space will make a total of 80,000 square feet of operating space, which the company now has. The company is rushed. It has recently greatly increased its equipment, adding much new machinery.

Rockwood Sprinkler Company, manufacturers of automatic sprinklers, that has been rushed for several months on account of war orders, has gone on an eight-hour-a-day schedule. The help is to receive nine hours pay. Another large Worcester plant to curtail the number of hours worked and allow the men former pay is the Crompton & Knowles Loom Works, where the week was cut from one of 55 hours to 50 hours.

A new industry at West Brookfield, a few miles outside Worcester, is the Little Giant Toy Company. The company has been operating but a short time, but the contract has just been let for an addition 100 by 40 feet. The company is handicapped for floor space in its present quarters. Business is now and has been rushing at the plant for weeks.

The Clinton-Wright Company, manufacturers of wire products, recently figuring in the big merger through which the Wright Wire Company, the Clinton Wire Cloth Company, and the Morgan Spring Company were combined, has been cited by the war department. The citation came from the director of purchase, storage and traffic. Commendation is bestowed upon the company for its getting out on time, during the war, the large contracts let for much of the wire and wire specialities used overseas.

Worcester will have another industry. The Industrial Manufacturing Company, capitalized at $50,000, backed by Worcester capital, has been organized and plans have been laid for the manufacture of several metallic commodities. A self-locking nut is the article on which the company expects to do the greatest business. Charles W. Higginbotham is president of the company, and Edmund R. Cummins its treasurer.

Worcester Stamped Metal Company, 9 Hunt street, has established a new sales office at Indianapolis, Ind., Frank J. Coffey has been placed in charge of it. Mr. Coffey was formerly in the employ of the Morgan Spring Company and recently returned from duty as a lieutenant in the army.

Milton B. Hill, who has been doing a machine business under the name of the M. B. Hill Manufacturing Company, 10 Eden street, has had it incorporated under the name of the M. B. Hill Manufacturing Company with a $5,000 capital stock. Machine tools are manufactured.—W. J. B.

PROVIDENCE, R. I.

August 4, 1919.

The shorter working week and the scarcity of help are proving big handicaps to the industrial and manufacturing interests in this city and throughout the State. Practically all of the concerns irrespective of line of business have adopted the 48 hours a week schedule on the same wage basis that formerly ruled on the 54 or 55-hour schedule. The continued unsettled conditions between capital and labor are also proving problems of considerable and constant concern which the future, at present, offers no indication of solving.

It had been expected that with the return of the young men who had been in military and naval service both in this country and overseas there would be an improvement in the help situation, and that many of these men would return to their former occupations, but this has not been the case. With all lines of industry doing a record business the men are finding ample employment at outdoor work and so are not seeking or taking factory positions.

All lines of the metal trades are experiencing unusual activity, with sufficient orders on hand to insure their operation at capacity speed for several months to come. In the building lines the metal trades show a very noticeable improvement, while in the jewelry and novelty lines nothing equalling present conditions has been known in many years.

Jewelry manufacturers in every grade of goods are overwhelmed with orders, and many have stopped taking orders on which any delivery date is specified. It is estimated that the jewelers of Providence at the present time have upwards of $1,500,000 in orders on their books which is equivalent to about eight months normal production. But with the standardization of the business on the 48-hour basis, this means at least ten months business. All the manufacturing jewelry concerns are seeking help wherever possible to obtain, and the best wages ever paid are now being quoted. In fact, the great competition for help has caused another, and a very serious condition to arise that is proving one of the most disconcerting problems that has yet confronted the manufacturers—that of bidding for help and hiring away from each other. Taking advantage of this chaotic and "cut-throat" condition among the manufacturers, coupled with the great demand for help, the labor leaders have inaugurated a vigorous campaign to unionize the jewelry workers. In the past all efforts to form a jewelers' union have proved unsuccessful, but the present conditions are apparently auspicious for a more successful outcome.

Charles P. Sartolan is conducting the Majestic Enameling Company, at 25 Calender street, according to his statement filed at the office of the city clerk.

Articles of incorporation have been issued from the office of the Secretary of State under the laws of Rhode Island to Joseph E. Miller, Inc., for the manufacture of jewelry in this city. The capital stock is $20,000, and is divided into 200 shares of $100 each. The incorporators are Harry Balcher, Benjamin Balcher, James E. Miller and Walter L. Main.

The Rhode Island Welding Company is erecting a one-story addition to its factory building on Bath street, this city.

Frank Mossberg, formerly President of the Frank Mossberg Company, at Attleboro, has sold out his interests in that company, and contemplates starting a metal stamping business. Announcement is not yet ready concerning the location and plans of the proposed new factory, but an effort is being made to have him establish it in Attleboro.

Mr. Mossberg has long been identified with the metal business of Attleboro. He started a repair shop there in 1887, and later developed a line of jewelry machinery and tools, besides turning out the Devline whistle, which was a famous toy. In 1896 he removed his expanding business to Providence, and three years later started another concern at Attleboro for the manufacture of bicycle bells and Mossberg wrenches. The products increased to include metal reels and spools and still later to include motorcycle and automobile parts. Finally work was begun

on engines for airplanes. The firm was given considerable attention some ten years ago when it was learned that Canada was having its parts for the Ross rifle made in Attleboro, a fact that became an important issue in Canadian politics.

The firm was incorporated as the Frank Mossberg Company in 1903, and by 1909 it had outgrown the available factory space. Through the Attleboro Board of Trade a new factory was provided, and the firm concentrated its entire factory activities in the one plant. At that time upwards of 200 men were employed by the firm. During the world war the firm worked its plant both night and day shifts, and recently contracts were made for the further additions to the factory space.—W. H. M.

ROCHESTER, N. Y.

AUGUST 4, 1919.

Midsummer, with its intense heat and vacation tendencies, has failed to check in the slightest manner the industrial progress of this city. With hardly a single exception, every big plant in Rochester is being operated at top speed, and the activity is not confined to the users of metal by no means.

Despite fears to the contrary that prevailed in certain channels, the big plants of the Eastman Kodak Company and the Bausch & Lomb Company have not only practically readjusted themselves to a pre-war basis but have greatly enlarged their field of activity. The Eastman Company not only took back every soldier and sailor who left the plant when war broke out with Germany, but several hundred additional workers have found profitable employment in some of the many branches of the kodak works. The optical company had planned, before the armistice was brought about, to extend its business in the United States as well as abroad. In carrying out this plan the big buildings erected for war purposes have since been occupied in the scheme of enlargement, and the concern is now reaching out for the business that the war interrupted.

The several large buildings that were occupied by cannon and shell-making concerns during the war are about to be taken over by new industries. Barring the strikes, which are becoming a little too frequent in Rochester, the city is undergoing a remarkable era of prosperity.

Copper and brass sheets, tin plate and zinc are in firm to strong demand by all the industries employing metals in this city. Railroad facilities have eased during the past month, and shipments of finished products out of town have improved. Shipments of supplies into Rochester, however, have not met with the same degree of improvement, although there is no great inconvenience suffered. Copper is obtainable in any fair quantity, as is brass sheets and rods. Prices have undergone little change. Lead is in good demand and is readily obtained. The demand for tin is unusually heavy just now, and deliveries are not guaranteed. In fact from eight to ten weeks are required for deliveries from outside headquarters to Rochester. Manufacturers here have a fairly large supply of tin at hand. Advances in the price of tin materials is anticipated. Aluminum is quiet and in free supply.—G. B. E.

ROME, N. Y.

AUGUST 4, 1919.

Every effort to bring about a settlement of the strike which has tied up major operations in the plants of the Rome Brass & Copper Company, Rome Manufacturing Company, Rome Wire Company, Rome Metal Mill, Rome Hollow Wire & Tube Company and the James A. Spargo Wire Company, has thus far failed, and the strike, which has been in effect for nearly two months, is still on at this writing.

It is the most serious labor disturbance ever experienced by the metal mills of this city, and is said to have come as the result of a reduction in wages through the discontinuance of a 10 per cent. bonus which was paid the employees during the war. Resentment on the part of the workers followed this action by the manufacturers, and, with an already perfected union embracing most of the employees of the various shops, the workmen promptly went on strike for an eight-hour day and an increase in wages.

For more than a month the situation was without incident, except some few acts of unruly pickets, who interfered with foremen and office employees and a small number of workmen who continued at work. However, on Monday morning, July 14, the situation became suddenly critical, when great numbers of striking workmen, mostly of foreign birth, violently attacked everything and everybody traveling in the direction of the mills. The climax came about 8 A. M. when two prominent manufacturers were set upon in their automobiles by a lawless element and severely handled, notwithstanding the presence of policemen and deputy sheriffs.

City officials at once realized that the situation was fast getting beyond the control of a considerably increased force of peace officers, and Mayor Midlam immediately telephoned Governor Smith at Albany, setting forth the condition of affairs, and requested that State troops be at once dispatched to this city to prevent further acts of lawlessness. The request was promptly granted and evening found mounted State police riding into the city, for their first service in connection with conditions arising from labor troubles in this State.

The more or less riotous condition which existed earlier in the day, coupled with the request for State police, gave rise to false reports as to the true nature of affairs here. Out of town newspapers printed stories to the effect that two or three persons had been killed during the disorders of the morning, whereas no one was even seriously injured.

However, the feeling was quite general that the State troops arrived none too soon to make the situation secure. They remained in Rome more than a week and performed excellent work in connection with the local police, making more than 70 arrests on charges of sedition, carrying concealed weapons, rioting and other offenses. Citizens were astounded at the disclosure that 92 aliens living in the city were in possession of permits to carry firearms. This information was brought out as a result of the riot of July 14, and much relief was felt when a court order revoking the permits was granted and the guns were gathered in by the police and State troops. From this stage on, violence ceased entirely and effort after effort has been made to end the strike but without success.

Mayor Midlam wrote each company with a view to bringing about a conference between the men and the employers. In reply to the mayor's letter, H. T. Dyett, president of the Rome Wire Company, under date of July 17, wrote in part as follows: "As our shop is what is known as an open shop, we naturally take the stand that we neither deal with out of town or local labor organizers, nor with any committees appointed by them. We are ready today as in the past to deal with any of our former employees individually. We believe that our employees appreciate that they have received fair treatment at our hands in the past and will now return to work, with confidence that they will be dealt with fairly."

Percy C. Thomas, general manager of the Rome Manufacturing Company, wrote that the invitation extended by the companies involved in the strike, issued on July 9, still held good. The invitation of July 9 was in the form of a printed notice, announcing that the mills were being run on the "open shop" plan and that all loyal workmen who wished to return to work on the same conditions that existed prior to the strike might do so. Mr. Thomas's letter read in part as follows: "It is not the policy of the company to confer direct with union organizers, or to confer with them through committees appointed and instructed by them. If, however, any former loyal employee has any grievance, as an individual, against the company, the management of the company will be glad to confer with him, as an individual, at any time."

No material change came as a result of the mayor's efforts to bring about a conference of workers and employers.

According to the latest information bearing on the strike situation, a petition signed by nearly 150 business and professional men has been sent to Governor Smith asking the State Industrial Commission to conduct an inquiry under the power given it by statute. The petition was forwarded to Governor Smith on July 26, according to the information, which says "It is hoped by the Merchants' Committee and its signers that some good will come from this disinterested effort to bring all parties together."

For some days there was a persistent rumor in Ilion, a short distance from Rome, that the Overland people of Toledo, Ohio, were negotiating for the use of the former Remington munition plant in Ilion for the manufacture of automobiles. The Overland Company, however, has denied the report.

The Oneida Community, Ltd., located at Sherrill, about ten miles southwest of Rome, has announced that beginning September 1, that organization will establish 45 hours a week as its regular work schedule in all its factories, in place of 50 hours as at present, and that on that date all factory wage rates will advance sufficient to enable each employee to receive the same wages that prevails at present. Quite a number of former Rome workmen have secured employment at Sherrill.—M. J. D.

PITTSBURGH, PA.

AUGUST 4, 1919.

The latter part of July finds the Pittsburgh district preparing for a much more animated movement in the majority of the trades. The building situation is letting go with a rush. Labor is scarce and a big percentage of the men that are to be had are shiftless and of no account. The lack of disposition to stock up, which has been apparent for some time now, is slowly disappearing, it is reported, owing to the fact that the trades as a general rule are at last realizing that all this talk about prices not going to drop was not all bosh after all. Prices, generally, are holding firm with a few advances.

Local aluminum manufacturers are running their mills night and day and find it impossible to keep abreast with the flood of orders. One of the heaviest demands is for type metals. This field has shown considerable activity right along but with the return of the pre-war postage rate quite a number of firms are doing the bulk of their advertising through circular letters, pamphlets and catalogues. Copper and brass are not yet experiencing such brisk markets but conditions with these commodities are daily growing better. Zinc too is not moving as might be desired.

From all sides comes assurances that the coming months will see a real prosperous season in nearly all branches of industry.

The Lava Crucible Company with offices in the Jenkins Arcade have recently undergone a reorganization and will move to their new offices at 1502 First National Bank Building, August 1. William Metcalf, Jr., president, besides handling the work of his present office will also take charge of the sales end of the company's business. This firm is building additional kilns to its plant at Zelienople, Pa., and will shortly be enabled to greatly increase their output of crucibles.

E. K. Price, of the Standard Underground Cable Company, has recently returned from overseas, where he was engaged in Y. M. C. A. work as business secretary at Grenoble, Bavaria, and has resumed his duties as advertising manager.—J. A. C.

CINCINNATI, OHIO

AUGUST 4, 1919.

Despite the fact that there has been an advance in prices of brass and copper products in the past month that will approximate between 40 and 50 per cent., the demand for the materials continues active. Output of finished material has been somewhat retarded owing to labor unrest in several sections of the industry where the trade experienced a strike of from three to four weeks, which set production back considerably.

The activity in the metal trade has been most pronounced, notwithstanding adverse labor conditions and inquiries have been numerous with the volume of business increasing, despite the higher prices. Foreign business of the local companies also is increasing with prospects of the coming fall, greater than ever.

A very pleasing aspect of the local trade is that the usual summer dullness has not made its appearance anywhere along the line. In fact, several of the larger concerns find the volume of business so great that they are pushed to capacity to take care of it.

Interest in the trade the past month, centered in the announcement of the Lunkenheimer Company, perhaps the largest manufacturers of brass products in this section, that it would erect a complete plant in Carthage, O., a suburb of Cincinnati, at a cost of $1,500,000. The plant in Fairmont will be abandoned. The new plant will cut down the cost of production by doing away with the great cost entailed in handling the product, the buildings at the present plant being separated by streets. At the new plant, construction of which will be started in the fall, this cost of handling will be eliminated.—H. C. L.

CLEVELAND, OHIO

AUGUST 4, 1919.

Two comprehensive movements for an absolutely safety first campaign in Cleveland factories was begun here this week in meetings of factory foremen and superintendents and of factory heads. Three hundred factories are represented in one movement. Initial meeting was held at West Side Chamber of Industry Hall by representatives of these plants, where they were addressed by W. R. Rasmussen, field secretary of the National Safety Council, and at which meeting they pledged their support to the movement. In his talk to the members, Mr. Rasmussen claimed that practically all factory accidents are inexcusable and might be prevented if shop foremen took proper precautions. He cited the case of the Omaha plant of the National Smelting and Refining Company, where in two years minor accidents were reduced 90 per cent. and fatalities and permanent injuries eliminated entirely. He claimed that the safety movement is the first common ground upon which employers and workers can meet, and that it is the first step toward efficient production. He also claimed that it is up to shop department foremen to impress upon workers the need for safety and to explain the method of putting safety into practice.

Further development of the movement has been started by manufacturers themselves following a meeting at Hotel Statler where C. B. Auel, of the Westinghouse Electric and Manufacturing Company, Pittsburgh, spoke. Mr. Auel pointed out that safety to workers is not merely accomplished by safeguarding machinery. He showed that it is a question of psychology, industrial relations and Americanization. One measure that must be recognized as leading to this end, he said, is reduction in labor turnover. He showed that from experience in the Westinghouse plant that accidents can be reduced as much as 75 per cent. if all men can be induced to stay with the company.

These meetings are preliminary to a concerted movement that will be launched here in all industry in connection with the Safety First Congress to be held in Cleveland in September.

Members of the metal industry are now giving more attention to the lead taken by officers in other branches of production here, in dividing profits with employes. Illustration of this was given at the outing of 500 employes of the Jordan Motor Car Corporation held at Willoughbeach, and at which meeting $5,000 was distributed among employes as their share of profits. The presentation by made by Edward S. Jordan, president, himself. The awards went to employes who had remained with the company at least one year. It is now believed that this provision is one of the principal factors that will make for greater production in all plants here in the future, and the plan at the Jordan is being investigated by several large interests who may announce in a few weeks its introduction in their own plants.

Probably the best development in the "jobs for Yanks" movement since the boys began to return to Cleveland from service abroad, is that put into practice at the Grabler Manufacturing Company this month. Former employes of the plant, and others who have been incapacitated by their war work, have been assigned to a special department where they are capable of meeting the industrial requirements but not capable of filling the jobs in ordinary employment. There are eleven in this department now, and the number will be increased as work and applicants increase. Other plants will be supplied with workers thus afflicted through the activities of the Association for Disabled and Crippled, headquarters in Cleveland City Hall. Edward I. Benson is in charge of this bureau, and has interested other plants in and about Cleveland in placing such workers. The plan is to pick both job and worker, so that both are fitted for each other.

Additional expansion in the metal industry here is noted this month in plans for new organizations coming to Cleveland and others enlarging their establishments. The Drew Electric and Manufacturing Company, an Indianapolis corporation, manufacturing electrical fixtures for railroads, has purchased acreage in the eastern section of the city with Nickle Plate tracks facilities, and plans the immediate construction of a $50,000 factory building. The structure will include offices, brass foundry and a machine shop. The company now has fifteen agencies in the United States and Canada, and operates throughout the North American continent. James H. Drew is president of the company. Actual operation of the new Cleveland plant is planned for September 1.

A new and larger plant for the Cuyahoga Spring Company

has been started on the West Side, and the plant is expected to be in operation by October 1. The present plant on the East Side will be vacated to make way for the Pennsylvania Piston Ring Company.—C. C. C.

COLUMBUS, OHIO.

AUGUST 4, 1919.

The metal market in Columbus and central Ohio territory is developing considerable activity in every line. The demand is increasing, and with receipts fairly good the volume of business is also gradually increasing in all localities. The tone of the trade shows wonderful improvement during the past month and metal dealers, as well as jobbers, believe that the slump is now definitely over, and that trade will continue to expand.

Prices have advanced to a large extent, and consequently the hesitancy of the trade is passing away. A wide range of prices is unknown as trade is pretty well defined and cheap prices are a thing of the past. Metal using concerns are buying more and more for the future, and there is a definite movement to accumulate some reserve stocks.

The Automatic Metal Products Company of Springfield, Ohio, has been chartered with a capital of $50,000 by R. E. Westfall, O. C. Burmeister, F. H. Andrews, E. K. Merwine and Louise Spencer.

The authorized capital of the American Metal Products Company of Cincinnati has been increased from $25,000 to $50,000.

The Metal Smelting Company of Cleveland has been chartered with a capital of $10,000 by Max P. Goodman, A. H. Goldman, A. L. Steuer, A. Kreje and S. Lorditch.

The Atlantic Brass and Aluminum Foundry Company of Cleveland has been incorporated with a capital of $10,000 by Oliver Lynn Mitchell, Edythe Kaplan, T. J. Clark, C. Wallace and A. H. Nichols.

The Toledo Metal Products Company of Toledo has been chartered with a capital of $100,000 by Frank H. Schroeder, Harold H. Snyder, William P. Corbett, William H. Lachmiller and Lawrence R. Wilbur.

The Ohio Aluminum Products Company of Cleveland has been incorporated with a capital of $50,000 by H. H. Felsman, G. W. Poppleton, R. A. Lawrence, C. D. Richt and C. E. Melen.—J. W. L.

DETROIT, MICH.

AUGUST 4, 1919.

The Pennsylvania railroad which is now building a new line into Detroit from Toledo, will open up many miles of new factory territory that is greatly needed at the present time. Detroit's growth within the last few years has been so exensive that terminal facilities at present are inadequate. The Pennsylvania railroad is now engaged in the expenditure of millions of dollars in order to get into the rich Detroit freight territory. It is expected trains from this line will be entering over its own tracks in less than one year. Among the very first to encourage the entry of the Pennsylvania into Detroit were the great automobile concerns and the brass, copper and aluminum plants which are closely allied to the automobile industry. This new line will almost completely encircle the city crossing it from the northwest extending around to the Ford plant and to the other big automobile, and brass, copper and aluminum plants on the east side of the city.

The great Ford plant is scheduled for a still greater development. Henry Ford and his son have acquired all the stock excepting 2,000 shares now held by James Cousins, Detroit's present mayor. It is reported the deal represented a transaction of about $100,000,000—quite a bunch of money, every one says. There's another report that the Fords are about to acquire the interests of Mayor Cousins and it is no doubt that this will go through sooner or later. It is understood the Fords will, in the near future, place a new car on the market that will sell for considerably less than the one now manufactured. Furthermore it is reported that production will be greatly increased and that the minimum wage will be seven dollars a day. At the present time it is six dollars.

Most of the brass, copper and aluminum plants here report a steady increase of business. They prosper in spite of the high cost of materials and advancing wages.

There's practically no labor difficulty here now and manufacturers as a rule see no reason why any disruption should occur. The highest wages are paid and there are more jobs than there are men to fill them.—F. J. H.

CHICAGO, ILL.

AUGUST 4, 1919.

The general factors influencing the situation in the various branches of the metal trades in and around Chicago are all that could be desired, in most respects. There is certainly no lack of business, the machinery manufacturers and the founders, as well as the coppersmiths, having ample orders to keep them well engaged for some time to come, with plenty of business ahead of them in virtually every branch of the trade. Moreover, the financial outlook, always an important phase of the situation, is extremely favorable; more so, perhaps, in this section than in some others, although that is not necessarily the case. The fact that Chicago is the world's greatest grain market, however, and that the billions of dollars representing the sales of the vast wheat crop, the corn and oats crops, and of the livestock of the Middle West and the Northwest, will flow through the banks of this city, cannot be ignored as a factor in general business activity. It has been a matter of comment among bankers during the past year or so that the West is no longer dependent on New York for crop-moving funds, on account of its increasing ability to turn its crops with sufficient rapidity to enable local banks to care for this once delicate matter. Liquidation of the past two or three crops at record-breaking prices has, in fact, placed the country banks and their Chicago correspondents in such a strong position that they can finance the needs of the farmers without a ripple; and this is bound to be reflected in better business for the entire community. Specifically, it is a fact that there is such an enormous demand for automobiles and for high-grade farm equipment, all involving the use of metals other than iron and steel, that the factories cannot keep up with orders; and in turn, industries supplying metal-working equipment and other factory supplies are experiencing an increased demand for their goods. In brief, it can be said without exaggeration that war business has hardly been missed, so prompt and vigorous has been the turn toward peace business, much of which has been postponed for four years to the needs of Mars. There is no denying, however, that there is a good deal in the labor situation to cause uneasiness.

Pessimism over developments which are merely anticipated, and which may never occur, is of course wholly unwarranted, in view of the healthy condition of business in general which has been referred to. There have been specific occurrences, however, very lately, which have interfered directly and seriously with the progress of industry in its movement toward big peace business, notably the strike on June 27 of 10,000 members of the various building trades unions, principally common labor, these men demanding an increase from 57½ to 75 cents an hour. Employers declare that they cannot meet this demand, and that it will not be granted. The net result, however, has been to halt operations on a score of big building projects and on numerous others less important; and it is hardly necessary to say that the revival in building work has not only been one of the most helpful to the metal trades, but has been one vitally necessary to take care of housing difficulties and to enable business to catch up with the requirements postponed by the war. Various workers in special branches of the metal trades proper have received during the past two or three years substantial increases in wages, and for the most part they are fairly well contented. In spite of this, however, there is a certain vague and undefined feeling of unrest among them, which has found expression in some instances in small strikes and walkouts, hampering individual houses to a greater or less extent. The Chicago organization of brass manufacturers has been considering the situation in its informal summer conferences, and will of course meet whatever emergency may arise. It is the general hope, it goes without saying, that there will be no widespread or serious labor trouble, and it is felt that there is no real cause for anything of the sort, especially in view of the need for the co-operation of all in meeting the business needs of the future.—K. C. C.

MILWAUKEE, WIS.

AUGUST 4, 1919.

The metal trades industries in Milwaukee have indeed been fortunate in escaping the wave of striking which has gripped many of the city's plants during the past month, but manufacturers are knocking wood and are not so sure that they will be hit sooner or later. The one question uppermost in the minds of the workers is to strike, but as war-time salaries have been retained in the metal working plants, manufacturers are having remarkably little difficulty with their employes.

Metal working plants are working at about 75 per cent capacity, which, it is stated is doing remarkably well during a reconstruction period such as the industries are now going through. In Milwaukee and in concerns in various parts of the state report business conditions satisfactory.

One thing that is worrying manufacturers no little bit is "When is the government going to settle for war-time contracts?" Despite the fact that the armistice was signed in November and peace already signed, less than 50 per cent of the war contracts have been made good by the government. However, the manufacturers have been advised that this settling of contracts is a slow procedure as it must pass through many hands and are waiting patiently for their turn.

Materials are holding at about stationary prices, although much of the stuff has experienced an advance. This is an indication, it is pointed out, that there is a big demand for it which evolves itself into the belief that conditions are satisfactory all around.

The following statement regarding readjustment was made to THE METAL INDUSTRY correspondent by A. W. Beresford, general manager of the Cutler Hammer Company:

"There must be a readjustment, but the governor is correct in his message to the legislature in stating that this readjustment should come about naturally, and not by force," said Mr. Beresford. "No man who has held a position of responsibility where the relation of employer and employee exists and who has given thought to the problems involved in this relation feels today that the proper method of adjustment is by strife. There is a common ground of interest which can be reached as soon as certain differences in underlying principles are adjusted and as soon as each side believes that the other is conscientiously endeavoring to reach a solution. The mere agreement between the two so-called parties in interest—capital and labor, however, will not be sufficient as experience shows that agreement between the two tends toward combination of interests between the two, usually at the public expense.

"In any such agreement the public interest must have ample consideration. The feeling appears to be that the manufacturer has made excessive profits and that a desire on his part for a continuance of these profits is at least partially responsible for the present high living cost.

"Speaking for the metal trades, this is not the case. I believe that investigation would show that the average profits of the trades engaged in the manufacture of articles from metals are in no wise greater than are warranted by the risks of the business and in many instances are less. Where excess profits have been due to war conditions and the production of munitions, the revenue measures as written have been sufficient in most instances to reach these and return them in large part to the government."—B. E. S.

LOUISVILLE, KY.

August 4, 1919.

The general demand for copper and brass goods is good with both the jobbers and manufacturers. Coppersmiths are busy on job work of various kinds, and the allied trades as a whole report an excellent run of business. Several houses are still working on Government work of one kind or another, while general commercial business is improving. Manufacturers and jobbers of plumbing goods report a much better demand than had been experienced for some time past, due to a big improvement in building operations. Oil operations in the State are also taking a good deal of material, there now being two large refineries in Louisville, with two more building, all of which require a considerable amount of lead work in acid refining plants, as acid is used over and over in distilling. The McCombs Producing & Refining Company, Louisville, with refinery at East St. Louis, is also making a large addition, upon which it will shortly accept bids.

Increasing copper and labor values have been two of the principal subjects discussed during the past month. Copper has been advancing rapidly, and Louisville has had her hands full with labor troubles, starting some months ago with the clothing workers, and spreading to printers, bakers, electricians, telephone workers, moulders, machinists and others, with a threatened general strike. The labor situation is far from satisfactory, and no one is making any predictions on where it will end.

Moulders walked out of a number of shops late in July, along with machinists, a few non-union shops managing to keep going. Moulders are striking for seventy-five cents an hour, an eight-hour day, time and a half for overtime, double time for Sundays and holidays, recognition of the union, and a few other points. They may get seventy-five cents an hour.

Coppersmiths are asking an increase to seventy cents an hour with an eight-hour day, etc., and threatening to strike shortly if demands are not complied with. Leading coppersmiths state that a strike may occur, but that indications are that the manufacturers will arbitrate, and keep the men working, as the shops are rushed, and there should be an increase in wages as well as prices for finished work to consumers.

A number of the old distilleries are now being dismantled, and converted into syrup plants, grain plants, feed mills, etc., but it will take some time to find concerns to occupy the numerous Kentucky plants. However, copperwork is being steadily torn out and thrown on the market, and better heavy copper scrap is not to be found anywhere.

Hines & Ritchey and the Standard Milk Machinery Company are managing to keep very busy on milk machinery, which is in big demand. This year the company is giving almost its entire attention to milk machinery.

The Matt Corcoran Company is still busy on Government work with a few fair contracts on general commercial work, the plant working at near capacity.

The Vendome Copper & Brass Works is making headway on several good contracts for acid plants of one kind or another as well as soap plant work, and has business on hand that will keep it going several months.

Some good contracts for copper kettles is keeping the force at the plant of Ahlers & Gregoire fairly busy, along with a good run of general commercial business.

J. W. Rademaker, of the Independent Brass Foundry, reports that he is still running his shop almost full on Government work for the C. Lee Cook Company, of Louisville, and is considerably behind on commercial work.

At the plant of the Standard Sanitary Manufacturing Company, manufacturers of bathtubs and brass plumbing goods, business is rushing, and the company has been advertising for additional men.

The Columbia Sanitary Manufacturing Company, manufacturers of plumbing goods, has been issued a permit for erection of a $25,000 addition.—O. V. N. S.

PHILADELPHIA, PA.

AUGUST 4, 1919.

The metal industrial plants of Philadelphia, generally speaking, are not very busy, and only a few may be said to be running at normal capacity. This city was one of the most active in the country in munition making and, in fact, all forms of war work, and the metal industries, taken as a whole, have not yet gotten back to the normal peace basis which everyone expected would come soon after the signing of the armistice. Conditions are still largely in a waiting attitude.

The only really busy plants are those making specialties for the automobile trade. The largest of these is the Edward G. Budd Company, manufacturers of auto bodies. They are putting into service as fast as possible some large additions to their Nicetown plant and are extending their capacity as fast as they can obtain competent workers. Their employes number about 4,000.

The brass foundries have been dull, but indications are that their trade is picking up as many good inquiries have been re-

ceived lately. Fairly good business is being done by makers of machinery for the tobacco industry, boiler and steam specialties, and textile machinery. Orders for the latter have recently had a spurt because of the 44-hour week which has gone into effect, making necessary greater factory equipments to maintain normal production.

Builders of machine tools, elevators and mining machinery are running slow. Shipbuilding continues at a rapid pace, practically all the large Delaware River yards continuing at full speed.

Labor is generally quiet. There is not any unemployment to speak of in any industry and when business gets to full capacity a serious shortage may be expected in some lines. There is difficulty at present to get the better grades of skilled mechanics. A number of out-of-town advertisements are being run and some men are said to be leaving for the middle western cities, especially the automobile centers.

The Henry K. Fort Company, of Philadelphia, was the highest bidder for approximately 62,186 pounds of pig nickel, 99 per cent. pure, offered by the United States Government, bids for which were recently opened at the Philadelphia district Ordnance Office. Their bid was .3228 cents. The Columbia Smelting & Refining Company, of New York, was the next bidder with .305 cents, and Joseph Rosenthal Sons Company's bid at .2825 was the third highest received.

The Merchant & Evans Company, 2035 Washington avenue, manufacturers of tin plate and metals in all stock forms, has acquired a factory building on property, 125 by 200 feet, at Twenty-first street and Washington avenue, from E. W. Dwight, for a consideration of about $50,000, including equipment. The structure will be used by the new owner in connection with its regular production, the demands of which have recently grown beyond the former normal capacity.

The Philadelphia Roll & Machine Company, Twenty-third street and Washington avenue, has broken ground for a new one-story foundry building to be 46 by 60 feet in dimensions.—G. B. G.

TRENTON, N. J.

Business conditions in the Trenton metal industries are beginning to show some improvement and it is now believed that the trade will continue to grow good from now on. The Westinghouse Lamp Company is advertising for more help and is giving employes steady work at good wages. The company has the best sanitary working conditions of any factory in this section. The Skillman Hardware Manufacturing Company announces business improving. An official of the company said that building was now on the increase and that it was expected that the trade would be greatly stimulated in another month. "We have no fault to find," said the official, "and we have kept running without laying any of our help off. The outlook at this time is very good."

Charles W. Carll's Sons, West Front street, have installed a modern welding shop to their plant. The shop is equipped with five Davis-Bournonville welding torches and a cutting apparatus.

The Presto-Lite Company has purchased seven acres of land from the Atlantic Smelting and Refining Company at Newark and will erect a new plant. The smelting company will soon erect modern buildings for smelting and refining metals, and when completed will remove their main plant from Brooklyn.

General Frederick Gilkyson and State Comptroller N. A. K. Bugbee have been appointed a committee to select the bronze metals to be given to the New Jersey soldiers who served in the world war. About $100,000 will be spent for the medals.

The Passaic Metal Ware Company, Passaic, N. J., is having plans prepared for a factory community for the company's employees. The company purchased a tract of eight acres and will begin the erection of the houses in a short time.—L. A. L.

VERIFIED NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Massachusetts Machine Shop, formerly of Worcester, Mass., has moved its plant to 817 Albany street, Boston, Mass.

The Bristol Brass Corporation, Bristol, Conn., announces that it has increased its capital stock from $1,000,000 to $1,500,000.

The Premier Special Machine Corporation, 417-421 Canal street, New York, is having plans prepared for a new plant which will include among other departments, a japanning department.

Conrado Asenjo, San Juan, Porto Rico, is now in New York arranging for apparatus and supplies with which to equip a plating plant in his home city and which will be the first establishment of this kind in Porto Rico.

The Wagner Manufacturing Company, Sidney, Ohio, manufacturers of aluminum ware, has let a contract for an addition 80 x 200 feet, three stories, of concrete and steel. The company operates an aluminum foundry, grinding room, plating, polishing, japanning and lacquering departments.

The Hilo Varnish Corporation, Brooklyn, N. Y., announce that owing to the increased cost in all metals used in the manufacture of Hilo varnishes and enamels that it has become necessary for them to advance the prices of Hilo listed goods and accordingly have issued a new price list, effective July 15.

The National Copper and Smelting Company, Rose building, Cleveland, Ohio, has acquired a site on Babbitt road and the New York, Chicago, & St. Louis Railroad, and plans to build a three-story, 75 x 140 foot factory at an estimated cost of $25,000. They have a casting shop, tool room and tube plant.

A certificate of co-partners doing business under the fictitious firm name of **Western Plating Works,** for conducting a general nickel, silver, brass and copper plating business at 756 South San Pedro street, Los Angeles, Cal., has been taken out by Charles Waugh and John F. Fleckenstein, both of Los Angeles.

E. W. Keeler, secretary of the **Rockford Brass Works,** Rockford, Ill., announces that the published report that the company has changed hands is not correct. Mr. Keeler states that the active management has been turned over to old employes but no change of ownership, policy or business of the company has been made.

Captain G. W. Franzheim, of the Non-Ferrous Metals and Miscellaneous Sub-Section of the Raw Materials and Scrap Section of the Purchase, Storage and Traffic Division of the War Department, Washington, D. C., announces that they have for sale about 2,500 tons of cupro-nickel analyzing 85 per cent. copper and 15 per cent. nickel and other such metals.

The Vulcan Engineering Sales Company, sales agent for Hanna Engineering Works, Mumford Molding Machine Company, Q M S Products, and the J. C. Busch Company, has been dissolved as of June 30, 1919, and on and after that date all business formerly done by the Vulcan Engineering Sales Company as sales agent will be transacted by **Hanna Engineering Works.**

Among the manufacturing companies which have lately taken up the group life insurance system for their employes are the **Billings and Spencer Company,** manufacturers of high grade tools, Hartford, Conn.; **Chase Companies,** Waterbury, Conn., which include the Waterbury Manufacturing Company, Chase Metal Works, and the Chase Rolling Mill Company; the **Corona Typewriter Company,** Groton, N. Y.; the **Chapman Valve Manufacturing Company,** of Springfield, Mass., and the **Doehler Die Casting Company,** of Brooklyn, N. Y. All of these concerns have placed their contracts with the Travellers Insurance Company of Hartford, Conn.

The following installations of electric furnaces have been made by the **Electric Furnace Company,** of Alliance, Ohio. Two Bailey electric furnaces at the Capital Brass Works, Detroit, Mich., to be used for melting brass scrap and borings; one at the plant of the Buick Motor Company, Flint, Mich, for melting phosphor bronze; a 50 K. W. rectangular tilting type at the plant of the Akron Bronze and Aluminum Company, Akron, Ohio, for melting gun metal, phosphor bronze, red and yellow brass; and one at the plant of the Dayton Engineering Laboratories Company, Dayton, Ohio, to be used for melting and refining aluminum. This latter furnace is similar to the one used for melting brass and will have a hearth capacity of 500 pounds and a melting rate of 200 pounds of aluminum per hour.

The Ayer-O'Connell Manufacturing Company, manufacturers of equipment for polishing, plating and buffing, Meriden, Conn., recently bought a four-story brick block on South Colony street of that city. The Ayer-O'Connell Manufacturing Company went to Meriden in 1915 through the effort of the Chamber of Commerce. At the start four or five employes carried on the work in the Runge property at the corner of George and Mechanic streets. At present there are about sixty on the payroll. U. S. Ayer, who is president, was the chief executive until a few months ago, when he was joined by A. W. Kempton, formerly purchasing agent at Landers, Frary & Clark's, New Britain, as vice-president and general manager. The company has an output in the west through the Bennett-O'Connell Company of Chicago.

The Adrian Brass & Aluminum Castings Company, of Adrian, Michigan, recently organized with a capital stock of $25,000 by Mr. Bachrach of Adrian and W. G. Snyder, recently in charge of foundries at the Thiery & Kendrick Manufacturing Company and the Detroit Motor Casting Company, has completed the installation of foundry equipment and the plant is now in operation. The foundry equipment, which was furnished by Frederic B. Stevens, of Detroit, Mich., consists of ten furnaces of the natural draft type, having a total output of approximately five tons per day, molding machinery, sand blast tumbling barrels, sprue cutters, grinding stands, air compressors, and, in fact, all the necessary apparatus required in a modern foundry. Mr. Bachrach is president of the company and Mr. Snyder is general manager.

ELECTION OF OFFICERS

The new officers of the **Hanson & Van Winkle Company,** Newark, N. J., are as follows: E. N. Todd, president; R. D. Foster, vice-president; E. N. Boice, treasurer, and W. L. D. Bedell, secretary.

At a meeting of the Board of Directors of the **Wheeler Condenser & Engineering Company,** Carteret, N. J., on July 8, J. J. Brown, formerly vice-president and general manager was elected president, succeeding Charles W. Wheeler, recently deceased. H. S. Brown, of 50 Congress street, Boston, Mass., was elected vice-president. No other changes were made in the officers.

FIRES

The plant of the **Crescent Brass Manufacturing Company,** Cleveland, Ohio, was damaged by fire recently at an estimated loss of $40,000. The company operates a brass foundry, tool and grinding room, casting shop, spinning, stamping, tinning, brazing, soldering, plating, polishing and lacquering departments.

A portion of the extensive chemical plant of Maas & Waldstein Company, Riverside avenue, Newark, N. J., was destroyed by fire July 31. The fire started in the distilling department where benzol is produced and caused more than a $100,000 worth of damage. Prompt action by the fire departments of Newark and Kearny prevented the fire spreading to a series of warehouses which contained hundreds of tons of soluble cotton and other highly inflammable chemicals. The room in which the fire started was one of eight sections, separated from each other by fire walls in a long concrete building extending most of 300 yards depth of the plant. Four sections were burned before the flames were checked. Dozens of drums of benzol and alcohol stored in the yard exploded, giving a miniature imitation of a shrapnel barrage.

The Maas & Waldstein Company, one of the largest manufacturers of lacquers and enamels in the United States, announces that in spite of the extent of the fire their business will be delayed but slightly. The resources of this company, both in factory buildings and in stock of supplies which were left untouched by the fire are so extensive that they are enabled to take care of the requirments of their customers at short notice.

FOREIGN METALLURGICAL EXCHANGE

The Societe de Valeurs pour Fers et Acier (Society for Values of Iron and Steel) in Schaffhausen, Switzerland, reports Consul General L. J. Keena at Zurich, has established in Zurich a metallurgical exchange the purpose of which is to bring together every Friday buyers and sellers of machines of every description and of all kinds of metals used in the manufacture of machinery. The exchange solicits the membership of foreign engineers and exporters of raw materials and calls particular notice to the advantages which a foreign member will have in the marketing of his products in Switzerland by visiting the exchange and bringing his business to the attention of manufacturers desiring to import. The fee for such membership is $5 a year.

TIN IMPORTS ALLOWED

The War Trade Board Section of the Department of State announces that W. T. B. R. 799, issued July 2, 1919, has been amended so as to advance from September 1, 1919, to August 15, 1919, the date on and after which pig tin and all metal alloys containing tin, including tin drosses, tin oxides, solder drosses, type metals, anti-friction metals, waste metals and other metals containing tin may be imported from points other than points of origin and without reference to the date of shipment.

Pursuant to the above mentioned amendment, on and after August 15, 1919, pig tin and all metal alloys containing tin, including tin drosses, tin oxides, solder drosses, type metals, anti-friction metals, waste metals and other metals containing tin will be permitted to be imported into the United States under General Import License PBF-37.

PLATINUM FOR SALE BY U. S.

The War Department is offering its present surplus of platinum for sale at a minimum of $105 per ounce, and iridium at a minimum of $200 per ounce, prices and orders subject to cancellation without notice. The sales will be made from the New York Assay Office and will be handled by the Committee on Sale of Materials, New York District Ordnance Office, 1107 Broadway, New York. The minimum offer which will be considered by the committee will be for a quantity of 10 ounces, and the maximum amount that will be disposed of to a single purchaser will be 1,000 ounces, unless the Director of Sales deems it advisable to grant special permission for a sale of larger quantities.

The platinum will be delivered in the form of grains or sponge, and, since the New York Assay Office has very limited facilities to prepare the product for delivery by either mail or express, the deliveries will be made wherever possible to the purchaser in person, cash being required in advance.

WAR TRADE BOARD TRANSFERRED TO STATE DEPARTMENT

Pursuant to an executive order signed by the President on May 12, 1919, the present personnel, duties, powers, functions and records of the War Trade Board have been transferred to the Department of State as of July 1, 1919.

This transfer will not affect or inconvenience the exporting and importing public in any way. The functions of the

War Trade Board will continue to be performed by the present personnel in the building at Twentieth and C streets, Washington, D. C.

All licenses will continue to be issued in the name of the War Trade Board, and all applications for licenses, and all correspondence pertaining to the activities of the War Trade Board, now assumed by the Department of State, should be addressed to the War Trade Board as heretofore.

The War Trade Board Section of the Department of State announces that it will issue licenses permitting the importation, on or after September 1, 1919, of pig tin and all metal alloys containing tin, including tin drosses, tin oxides, solder drosses, type metals, anti-friction metals, waste metals, and other metals containing tin, from points other than points of origin and without reference to the date of shipment.

BUSINESS TROUBLES

Charles W. Bosworth, referee in bankruptcy for the Metals Production Equipment Company, Springfield, Mass., has issued the following report by Harry C. Dodge, trustee:

RECEIPTS

Received for assets	$719,843.33
Received from Government in adjustment of contract	22,923.30
Gross receipts from operations	826,869.32
	$1,569,635.95

Funds otherwise available for distribution were used to the amount of $56,044.36 for additions to building and equipment necessary to carry on contracts.

PAYMENTS

Paid preferred liabilities accrued prior to trusteeship	$286,843.95
Allowance to attorneys	$16,283.37
Cash paid account operation	670,255.69
Administration expenses, including settlement of attachments, bond taxes, etc.	24,958.96
Compensation of trustee	10,000.00
Compensation of trustee in conducting the business	10,000.00
	$731,498.02
To Balance:	
Cash on hand	99,293.98
Receivable, Loring & Erickson	452,000.00
	551,293.98
	$1,569,635.95

A hearing on the above account was held at the court house in Springfield, Mass., at 2.30 P. M. on July 18, 1919.

PRINTED MATTER.

Condenser Tubing. The Wheeler Condenser and Engineering Company, of Carteret, N. J., have issued a unique price list of their "Crescent Brand" of condenser tubes. The booklet contains several fine photographs of the works and also tables giving weights and measures of seamless brass and copper tubing.

Casting of Aluminum.—Some very valuable and interesting information relating to the casting of aluminum is contained in a little booklet just issued by the British Aluminum Company. Some very important data is given in this publication, covering the mixing of aluminum alloys, molding and melting and a copy of it will be gladly furnished to anyone desiring it on application to the above mentioned company at 62 Front street, West, Toronto, Canada.

Sandblasts.—The Pangborn Corporation, Hagerstown, Md., has issued an interesting and valuable booklet that is devoted to descriptions and illustrations of an extensive line of sand-blast outfits. These include hose, cabinet, barrel, rotary table and room sand blasts. In connection with the various types of sand-blasts the Pangborn Corporation manufactures a number of different styles of dust arresters which are used to insure cleanliness and sanitary conditions around the sand-blast equipment.

Core Ovens.—The Foundry Equipment Company of Cleveland, Ohio, has issued a most comprehensive forty-four page catalog containing complete description and illustrations of Coleman ovens for cores and molds. These ovens are built to order and designed to meet local conditions in each foundry; therefore, it is difficult to issue a catalog which will show all of the different possibilities in the way of arrangement, design and construction. The information given in the catalog is general and illustrations are intended to show typical installations. Copies of the catalog may be had upon request.

Aluminum.—The Bureau of Standards, Washington, D. C., by S. W. Stratton, Director, has issued Bulletin No. 76 on Aluminum and Its Light Alloys. This bulletin is concerned, as its title indicates, with aluminum and its alloys and information is given that is calculated to be valuable to manufacturing firms, individuals and universities alike. The data and information has been put in the form of tables and curves, the curves being reproduced in such dimensions that accurate interpolations if values on them is possible by the use of a rule graduated in decimal parts of a centimeter. The bulletin may be had upon application to the Bureau for twenty cents each.

Buffing and Polishing Composition.—The subject of buffing and polishing compositions is one which has been surrounded with much mystery and more or less hocus-pocus. For this reason a really authoritative and trustworthy work on the subject has long been needed in the trade.

The first really clear and straightforward statement of the scientific principles underlying the action of buffing and polishing compositions is embodied in a 32-page booklet by Henry L. Zucker, the dea of composition makers. The entire subject is thoroughly and convincingly treated as no previous publication has treated it, and the booklet is of much interest and practical value to anyone having anything to do with buffing and polishing.

Zucker's Acme Brand of buffing and polishing compositions, which are manufactured exclusively by A. P. Munning and Company, were the first American compositions and have been manufactured continuously since 1863.

Copies of the bulletin may be obtained from A. P. Munning & Company, 50 Church street, New York.

FOREIGN TRADE OPPORTUNITIES

For addresses of these inquiries apply to Bureau of Foreign and Domestic Commerce, Washington, D. C., and give file numbers.

29,370.—The purchase by a firm in Spain of a kind of plated nickel alloy, a white metal sometimes called "alpaca," is desired. Quotations should be given f. o. b. New York. Payment, cash against documents in New York. References.

29,392.—The purchase of silicate of soda, borax, paraffin, boracic acid, solder, antimony, aluminum tubes, chloride of lime, seamless tubes, black sheets, galvanized sheets, and lead in wholesale quantities is desired by a firm in Spain. Terms, cash against documents at destination or in New York. Correspondence may be in English. References.

29,403.—The purchase and agency for the sale of chemicals, metals, heavy hardware, machinery and electrical supplies, are desired by a firm in Norway. Quotations should be given f. o. b. New York. Terms, cash against documents at destination. References.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

THE COPPER MARKET

By Grenville Mellen, President and General Manager, Continuous Casting Corporation, Garwood, N. J.*

We have read with considerable interest the recent address of chairman Gary of the Steel Corporation and more recently that of former President Vanderlip of the National City Bank.

We see in their respective addresses a trend of similarity, but withal hear varying and contrary interpretations placed upon them, contrasting the optimism of Judge Gary with the heralded pessimism of Mr. Vanderlip.

I have myself very carefully read both addresses and I have talked about them to men of great economic prominence. My judgment is that in their true essence they run parallel, both describing great forces for optimism. The only differences I can glean are difference of view-points. Judge Gary has viewed the world from the Rocky Mountains, while Mr. Vanderlip has spoken from the Alps.

Judge Gary has seen the world through the wealth of the American Continent, the Western Hemisphere, while Mr. Vanderlip saw it through the desolation of Europe, the Eastern Hemisphere, and what a great difference there is today between the Eastern and Western Hemispheres.

In the Eastern Hemisphere we see a continent, the population of which is divided into many races, and these in turn into many nations; peoples of varied purposes and conflicting interests; territories over-populated on the one hand and arid on the other. Its Asiatic masses, cast into an economic coma by their wierd religions, have slumbered for a thousand years; while the European civilizations had waged their commercial competition into such an entangling financial knot that it had to be cut by the swords of armies engaged in the most stupendous war of history.

Looking to the Western Continent we view our own fortunate shores. Here we find the land plenty; vast territories of rich soil bearing great crops; great cattle ranches which supply the larders of the world; rich reservoirs of mineral resources which give oil, coal, iron, copper and gold. This natural wealth in conjunction with our great industrial organizations and our international credit balances, make us the world center of economic gravitation.

For a moment let us revert to one hundred years ago. Today we are moving in a strange parallel to the Napoleonic era; not apparently running in the same direction but anomalously parallel just the same. In the early nineteenth century we find Europe aflame, the hereditary monarchies bent on destroying the French Republic, Consulate and Empire; the aristocracies allied and arrayed against the spirit of Democracy. Today, after a single century, we see the major nations, now in substance Democracies, allied and arrayed against the spirit of special privilege.

One hundred years ago the Holy Alliance was formed which was truly a League of some nations and had for its real object, subverting the ambitions of equality. Today we have a League of Nations organized in purpose to prevent Wars and to subvert the ambitions of Oppression.

THE EFFECT OF THE INCREASING STANDARDS OF LIVING

Apparently I digress, but all of these are matters which have an important bearing on the present copper market. I mean to indicate that the trend is away from special privilege and towards the economic betterment of all the people, which is *manifestly working for the sure elevation of the average standard of living.*

The business men of the world will come more and more to realize that their prosperity is increased with the *increased prosperity of all the people; that property rights are more secure as more of all the people own more of all of the property.*

We are now emerging from an old order of things into a new. The average standard of living will go higher and higher. The trend of wages will be upward, not downward. This engenders a vastly increased purchasing power in a greater world of commerce.

*An address made before the eighth annual convention of the metal branch of the National Hardware Association, held at Pittsburgh, Pa., June 6, 1919.

MAINTENANCE AND NEW CONSTRUCTION.

The means for communication and transportation have been severely used these last few years. Rehabilitation and renovation are necessary and expension will be required. Re-construction and new construction of nearly every character are sorely needed. It is announced that England must build one million homes; many will have to be built in France and the United States is far behind in its own normal additions. All these buildings will have to be more in keeping with a higher standard of living. Plumbing of all character will have to be of a higher quality, and this requires the further consumption of copper. More people will own automobiles. The electrical world will construct and expand. The demands of the increased international trade, that is soon to follow, will develop and maintain a growing merchant marine. Such activities will call for large amounts of copper and its products.

These are some of the circumstances which surround the copper industry at present. A wider market and a greater demand for copper therefore lie immediately ahead of us, which cannot fail to work for higher prices.

GENERAL STATISTICS

The price of copper today approaches 17 cents. Prior to the outbreak of the war it was selling at 13½ cents per pound and labor was getting approximately 15 cents per hour. After the declaration of war, during the months of August, September, October and November, the price of copper declined to 11¾ cents.

During this period of four months opinions were very pessimistic. But in the last month of the year 1914 the price recovered over 1 cent per pound. England had begun placing orders in this country to meet her munition requirements. From that time until March of 1917, with the exception of occasional slight reactions, the price steadily advanced to 36 cents. Soon after this the United States entered the war, and our Government agencies announced the intention of fixing the price. From late September, 1917, 23½ cents prevailed until July 2, 1918, when the price was advanced to 26 cents. In November, 1918, the armistice was signed, soon followed by suspensions and cancellations which shut off demand and started copper on its decline to 14½ cents.

Months passed with copper bordering upon 15 cents. Copper could not be moved; everyone had copper and copper products they could not sell.

During approximately the year and a half that we were at war, the Government had taken all possible steps to shut off peace pursuits and it gradually became every manufacturer's only customer.

Suddenly this one customer stopped buying; not only stopped buying, but suspended or cancelled its orders, and the many manufacturers were left high and dry without an outlet.

READJUSTMENT FROM ONE CUSTOMER TO ONE THOUSAND

Since then the phrase "surplus stocks" has been prevalently used, but in my opinion, in a very great measure, erroneously so. "Surplus stocks" generally implies stock in surplus over the normal demand. Now, not only was there no normal demand, but practically no demand at all. Therefore, the real condition that has existed is an industry with a large supply on hand and no demand. Of course, it may be argued that this has the same effect as a surplus over normal, and so it has, but in its sound diagnosis, it is not the same.

In the last several months, while copper has been selling at low levels, industry has worked hard to return to a peace footing. However, it takes time to reorganize so that the economic units in their interweaving interconnections assume the natural points of contact, between producers and consumers from original sources to ultimate outlets. It is because of this process that you are able to buy copper and copper products so cheaply today. As this interweaving is

effected, copper stocks will be gradually absorbed, accompanied by increases in price.

COPPER PRODUCERS' POSITION

An additional force is the copper producers' standpoint.

The large companies have made a great deal of money in the last four years. While they have so-called surpluses of copper they likewise have made surpluses of profits and it might even be regarded that these same surplus stocks are largely their surplus of profits. From this viewpoint the producers are not over anxious to sacrifice their already accumulated profits; and certainly not beyond the point that is deemed absolutely necessary to meet their current financial requirements.

Furthermore, it must be readily understood that the copper producer is not to be considered purely in the light of a manufacturer. When he sells copper he does not merely sell a product for so much, which has cost him so much, but in addition he is reducing his asset resources, for he has just that much less copper in his mines.

RELATION TO OTHER COMMODITIES

In addition to these factors, let us regard copper from the commodity value point of view. Copper selling today for 17 cents is about the same as selling it for less than 9 cents five years ago. Generally speaking, the price of one commodity is relative to the prices of other commodities. Relative to cotton at 30 cents per pound, to wheat at $2.26 per bushel, to corn at $1.75, and so on with the long list of commodities, *copper is selling approximately* 10 *cents per pound under value.*

TAXATION

Bearing in mind a point already mentioned, that when the copper producer sells his copper he is manifestly depleting his resource assets, it follows that, if copper costs him 15 cents to mine, smelt and refine, it is really cheaper to the buyer at 17 cents than to the producer at 15 cents. Then too, as the copper producer is conscious that he is depleting his assets with every sale of copper, added to the other obvious manufacturing considerations, he is forced to think of taxation. If he is going to make such and such an amount of money per annum as a net income he will endeavor to make his gross income such that the residue remaining after paying taxes will be commensurate with the expectations of stockholders. To accomplish this necessitates higher prices.

RELATION OF PAST PRICES TO PRESENT

It is of further interest to note that the average selling price of copper for the period of the last thirty years was 15½ cents per pound, which is today probably the approximate average cost to produce.

Today we find copper selling but 1 cent per pound above the grand average of the last thirty years. *Think what this means, when we compare the value of the dollar today with the value of the dollar of thirty years ago; and realize that labor rates have been increased about* 200 *per cent in the last five years.* Can you think, therefore, that under these circumstances copper will continue long to sell at practically its cost of production?

Consequent to the drop off in the sales of copper and the resultant decline in price has followed a materially decreased production. Cutting down production usually means the laying off of working forces which can be done very much more easily and quickly than the reverse. This will make difficult any rapid resumption of full blast production and will probably likewise result in a further increase in cost. Also the decline in price at its recent maintenance at comparatively low levels has worked for the dislocation of the high cost producer.

SURPLUS GOVERNMENT STOCKS DISPOSED OF

Another very favorable indication is the recent announcement by the United Metal Selling Company that acting for the copper producers it has purchased the surplus Government stocks. The effect of this is to substantially concentrate the possession of the so-called surplnus stocks in the hands of a highly capable and strongly financed organization. Needless to state, the endeavor will be to obtain the highest practicable price with a minimum of competitive offering.

FOREIGN MARKETS

The economic conditions of Europe today are certainly very bad. If they are so dark as Mr. Vanderlip paints them they truly could not be worse. It is likewise inconceivable to think that they will remain as they are. Such affairs must change and the only change remaining is for the better. In fact, reports from England already indicate material progress there. France today but awaits the peace treaty and the accompanying indemnity payments to precipitate a much retarded buying movement. The French Government rulings denying importations must of necessity fail, as all such economics by legislation must fail, for Parliaments, wherever seated, cannot create the materials their nations need and which they do not possess.

It is well known that Germany has been obliged to strip herself absolute bare of all copper and copper products. In 1913 Germany imported from the United States over 300 million pounds, and in the year 1914 up to the beginning of the war our exports to Germany were at the annual rate of 350 million pounds. Five years have since elapsed and at the pre-war rate of consumption 1½ billion pounds of copper have not gone into Germany that probably would have been exported there from here. Moreover, previous to the war, Germany had imported considerable copper from other sources than the United States, whish sources were substantially cut off after August, 1914, and entirely blockaded after 1915.

The Germans will have to make up this shortage as rapidly as possible, at least to the extent of their resources, which, though they are considerably less than before the war, will be ample for a very large demand. It may be said, however, that these annual imports by Germany in the years preceding hostilities was due to preparation for war. To this may be answered that the imports from or through countries other than the United States did much to suffice for this purpose. In 1913 Holland alone imported from the United States 179,000,000 lbs., the bulk of which was probably destined for and actually did reach Germany. In 1914, 126,000,000 lbs. had passed to Holland before England stopped this traffic.

The major nations of Europe are in the main industrial communities. They are yet insufficiently reorganized to give cash exchanges. We must, therefore, extend them large credits. South America, while rich in raw material resources and organic supplies, is in need of manufactured products. Our Southern Continent cannot obtain its full requirements from Europe. She likewise cannot obtain any extensive cash exchanges there. So it is not to be expected that the South American countries which have been and still are accustomed to receiving long time credits, could themselves be in a position to ship any considerable quantity of the commodities on credit. There is left but one logical course: South America must trade with the United States, by exchanging her minerals and her produce for money and our manufactured products. These same conditions hold substantially true as to Cuba and the remaining Latin-American countries, which *financial circumstances materially secure these markets to our commerce.*

GROWTH OF READJUSTMENT

In this country we find the restoration of demand for nearly all commodities progressing rapidly, although, of course, it is taking time. The degree of general employment is very high, scarcely less than it was last November and above the normal of previous general averages.

The process of industrial restoration in the European countries will be slower, for, it is natural to surmise, their manufacturing plants were more generally employed for war purposes. Even after the resumption or normal work in these countries, extensive competition with our industries will not be serious, for now they are confronted with a very considerably increased wage schedule.

The material needs of mankind today are great. Foreign areas of agricultural soil remain untilled, alike devoid of implements and of cattle; multitudes are unemployed for the want of raw materials and equipment. Some may regard

these as causes for pessimism, but they are of themselves, however, creative of great forces for a high optimism, a great prosperity for America.

THE EFFECTS OF THE WAR

The results of the war just ended give us World Empire, not politically nor militarily speaking, but commercially and financially so. This carries to us a grave responsibility, a deep duty and a large obligation to all those of human-kind less fortunate than ourselves. Some nations must receive their food from us; other states look to us for their raw materials; while still others depend upon us for their equipment and many manufactured products. This World trade will place a demand upon us that will parallel the recent demands of war, but, instead of having our vast productions consumed in such irretrievable destruction, the results of our efforts will be stored potentially and carried forward into a greater wealth, a greater prosperity than the world has ever known before.

METAL STOCKS MARKET QUOTATIONS

	Par.	Bid.	Asked.
Aluminum Company of America....	$100	$525	$625
American Brass	100	228	233
American Hardware Corp.	100	167	169
Bristol Brass	25	32	34
International Silver, com.....	100	30	32
International Silver pfd.....	100	92	96
New Jersey Zinc	100	255	300
Rome Brass & Copper.....	100	280	330
Scovill Mfg. Co.	100	405	430
Yale & Towne Mfg. Co.....	...	255	265

Corrected by J. K. Rice, Jr., & Co., 26 Wall street, New York.

METAL MARKET REVIEW

WRITTEN FOR THE METAL INDUSTRY BY W. T. PARTRIDGE.

COPPER.

Copper market led all other metals in activity, strength and the volume of sales made in July, at prices that advanced daily from ⅛c. to ¼c. per pound until July 24, when the heaviest buying movement since the war was ended showed indications of a slackening demand. The total rise in prices was 4½c. per pound from 19c. for prompt electrolytic; 19.25@19.50c. for prime Lake and from 18.37½c. for casting copper, to 23.50c. for electrolytic, 23.50@24.00c. for Lake and to 22.75c. per pound for casting copper. Over the remainder of the month the increasing lack of buying interest brought about a decline of 1.00c. per pound registered on both electrolytic and prime Lake and of ¾c. per pound on casting copper. The net advance, however, on all varieties amounted to 3½c. per pound, the month closing on a quiet market, the outlook being for a further easing off in prices until the next buying interest should be developed. On the last day, in the open market, prompt electrolytic was held at 22.50@23.00c.; prime Lake at 23.00@23.50c. and casting copper at 22.00c. October position being ¼c. per pound higher. Producers, however, held prices firmly at 23.50c. for the electrolytic and 24.00c. for September.

Statistically considered, the situation was improved; exports increasing and imports decreasing. Production in July, it was estimated would show a decrease from the June output, the latter having been 10 to 12 million pounds less than May production. Exports in July, for which full returns were not yet available, amounted to 15,861 tons and although not complete show an increase of approximately 3,000 tons over the June outgo.

TIN.

With the practical removal of all Government restrictions on pig tin accomplished, the market in July opened fairly active at unchanged June closing prices—70.50c. for Straits, 70c. for American pure, and at 68c. for Am. 99 per cent. metal. Following almost immediately, there was evidence of readjustment to the new conditions, which became apparent in irregularity of prices that resulted in a decline of ½c. per pound on all grades of spot metal. By July 9, Banca tin for August shipment from Batavia was quoted at 51.75@52.00c. and on July 18 auction sales of Government surplus Banca, amounting to 175 tons, distributed it in various sized lots at prices ranging from 65.25c. to 67.25c. per pound. The same metal, a short time later, was offered by the purchasers for resale at 68c.—formalities involving official transfers will inevitably delay deliveries of this tin to final buyers. While the total volume of business transacted during the month was not heavy, it was encouraging. At the end of the month business in spot metal was very quiet, quotations being 70@71c. for Straits, 69@70c. for Am. pure and 65.50@67c. for 99 per ct. metal. July-August shipment from the East Indies could be purchased at 54.50c. and Lamb & Flag, expected to arrive early in August, was offered at 54c. per pound.

LEAD.

The official base price of lead was advanced 60 points by producers during July, from 5 15c. East St. Louis, 5.40c. New York to 5.75c. East St Louis, 6.00c. New York, there having been three changes made: July 14, 10 points and 25 points each July 18 and 24. Outside prices, after the first advance, were held at a premium of 5 to 10 pounds over the basis of producers until the next change of the leading interest brought the two markets to identical figures, but for a short time only. Just before the last advance made by the American Smelting & Refining Company, outside prices were 5.65@5.75c. East St. Louis, 5.85@5.90c. New York, but following the advance to the highest figures of the month, outside figures declined to 5.65c. East St. Louis, 5.75c. New York for September position. Business throughout the month was in fair volume, but as was the case in all metals in the last week, the demand for lead showed a considerable falling off.

ZINC (SPELTER).

Activity, rising prices and buoyancy pervaded the zinc market in July until it was announced that a change had been made in the Government policy regarding disposition of its surplus stocks, from the tentative arrangement which the trade had understood placed the surplus in the hands of producers to be marketed by them in a manner not to disturb business. This information, given out July 22, acted as a deterrent factor because of the uncertainty engendered and indirectly brought about a decline in prices. Under active demand during first three weeks, prices had advanced 1.00c. per pound, from 7.00c. East St. Louis, 7.35c. New York, for prompt July and August positions to 8.00c. East St. Louis, 8.35c. New York, for prime Western spelter. The buying had been largely on domestic account, although some export business also, had been done before the drop in sterling exchange made such business prohibitive. By July 25, the general halt in demand in other metals, added to the attitude of the Government regarding its high grade surplus, was reflected in a sharp falling off in demand for zinc and prices declined daily until the end of the month, when 55 poinnts of the advance had been lost, leaving a net rise of only 45 points for the month. Prices on the last day were 7.45c. East St. Louis, 7.80c. New York for September and 5 points more for fourth quarter shipment.

ANTIMONY.

Unchanged prices, 8.37½c. duty paid New York for wholesale and 8.50c. for jobbing lots, were continued until July 16, the market being firm, but with only small business being transacted. The general improvement in all other metals, by that time, was largely responsible for the beginning of an advance on that day and stimulated activity that carried prices to the highest of the month, 9.37½. per pound on July 22. A week later—during which time, prices were stationary at the 1.00c. per pound advance, but with only small buying interest developed—delayed cables received from the Orient, indicated that shipment business might be done at 8.50c., c. i. f. New York in bond, for August-September positions and prompt metal here, declined to 9.25c. duty paid, there being no change thereafter. The net rise for the month was ⅞c. per pound.

ALUMINUM.

Aluminum business continued in steady volume during July. Prices for virgin ingots remained unchanged throughout the month at 32@33c. per pound. Other grades were advanced 1.00c.

per pound to 30@32c. for 98@99 per cent. remelted and to 26@28c. for No. 12 remelted during the last week. Sheets were unchanged at 42.20c for No. 16 and heavier, and powdered aluminum at 60@65c.

SILVER.

Silver prices in July fluctuated within a range of 4⅝c., the highest point being 107⅞ on July 3, and the lowest 103¼ on July 17, after which there was a recovery to 107⅝ on the last day. The break in sterling exchange to the lowest point of record was responsible for the lower prices here. Exports of silver in June were $13,000,000, a heavy falling off from the May outgo of $29,000,000. For the fiscal year ending June 30, however, there was an increase from $139,000,000 in 1918, to $301,000,000 in 1919.

QUICKSILVER.

Quicksilver prices in July advanced from $95 per flask to $109 per flask, making a net rise of $14. The first change was from $95 to $107 on July 5, when a scarcity of spot was developed. With a better supply on hand, there was a drop of $4.00 per flask on July 14, to $103 followed by another advance—presumably because of scarcity again developing—on July 26, to $109 per flask, these figures remaining unchanged thereafter.

PLATINUM.

The demand for platinum in July continued heavy with Government surplus available for distribution at $105 per ounce, minimum sales of 10 ounces and maximum sales of 1,000 ounces to any individual purchaser, being the rule. Market quotations outside of Government figures were unchanged at the June figures, $105@107.50 per ounce, throughout the month.

OLD METALS.

Activity, strength and advancing prices in the old metals markets continued in July until near the close of the month, when a halting in the general buying in major metals was noted. Its reflection became immediately apparent in a checking of demand for old metals. Prices, however, remained firm and unchanged with the exceptions of coppers and brass, which lost ½c. from their previous advance. The entire list of items shared in the rising prices, from ½c. on electrotype to 5.50c. to 5c. on strictly crucibled copper to 21c. per pound. The declines were 5c. on No. 1 pewter to 35c. and 2c. on block tin pipe after previously being advanced to 60c. Clean red car boxes and cocks and faucets were up 3c. each to 16.50c. No. 1 composition scrap and No. 1 brass turning were up 2¾c. each, the former to 18c. and the latter to 11.50c. Light copper and special heavy brass advanced 2½c. to 16c. and 13.50c., respectively. Uncrucibled copper wire was up 2¼c. to 18c. No. 1 turnings at 15c. was up 2c. per pound. A 1c. rise was made in light brass to 9.50c.; on old cast aluminum to 23c.; on new zinc to 6.25c.; on old zinc to 6.25c and stereotype to 6.50c. Heavy lead and tea lead were each up ½c. to 5.50c. for the former and to 4.50c. for the latter.

WATERBURY AVERAGE

Lake Copper. Average for 1918, 24.75. 1919—January, 23.00. February, 18.00. March, 15.50. April, 15.50. May, 16.37½. June, 17.75. July, 22.00.

Brass Mill Zinc. Average for 1918, 9,858. 1919—January, 9.00. February, 8.20. March, 8.00. April, 6.90. May, 6.80. June, 7.25. July, 8.10

JULY MOVEMENTS IN METALS

	Highest	Lowest	Average
Copper—			
Lake	24.00	19.25	22.08
Electrolytic	23.50	19.00	21.71
Casting	23.00	18.375	21.09
Tin	71.00	70.00	70.38
Lead	6.00	5.40	5.65
Zinc (brass special)	8.10	7.10	7.64
Antimony	9.375	8.375	8.807
Aluminum	33.00	32.00	32.568
Quicksilver (per flask)	$109.00	$95.00	$103.909
Silver (cts. per oz.)	107⅞	103¼	106.394

INQUIRIES AND OPPORTUNITIES

Under the directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies. procures positions and secures capable assistants. See Want Ad. page.

ADVANCE IN EXTRAS FOR SEAMLESS TUBES

The American Brass Company report an advance in extras for seamless tubes effective August 1, 1919, and until revised, as follows:

All seamless tubes, of gauges thinner than No. 16 Stubs (.065"), also all sizes smaller than ⅝" diameter of any gauge, extras for size and gauge, 50 per cent. advance over those shown in The American Brass Company's Price Lists and catalogues.

Schedules of extras applying to iron pipe sizes and condenser tubes remain unchanged.

Metal Prices, August 4, 1919

NEW METALS

	Cents.
Copper—Duty Free. Plate, Bar, Ingot and Old Copper.	
Manufactured 5 per centum.	
Electrolytic, carload lots	23 -23½
Lake, carload lots	23 -24
Casting, carload lots	22
Tin—Duty Free.	
Straits or Australian, carload lots	70½
Lead—Duty Pig, Bars and Old, 25%; pipe and sheets, 20%. Pig lead, carload lots	5.75-6.00
Zinc—Duty 15%.	
Brass Special	7.90
Prime Western, carload lots	7.80
Aluminum—Duty Crude, 2c. per lb. Plates, sheets, bars and rods, 3½c. per lb.	
Small lots, f. o. b. factory	...
100-lb. f. o. b. factory	...
Ton lots, f. o. b. factory	32½
Antimony—Duty 10%.	
Cookson's, Hallet's or American	Nominal
Chinese, Japanese, Wah Chang WCC, brand spot	9¼
Nickel—Duty Ingot, 10%. Sheet, strip and wire, 20% ad valorem.	
Ingot	41c.
Shot	43c.
Electrolytic	45c.
Manganese Metal	Nominal
Magnesium Metal—Duty 20% ad valorem (100 lb. lots)	$1.90
Bismuth—Duty free nominal	$3.10
Cadmium—Duty free nominal	$1.40
Chromium Metal—Duty free nominal	
Cobalt—97% pure	$2.50
Quicksilver—Duty 10% per flask of 75 pounds	$1.12½
Platinum—Duty free, per ounce	$107.00
Silver—Government assay—Duty free, per ounce	$1.07⅝
Gold—Duty free, per ounce	$20.67